

Barriers and Enablers to Vocational IT Education: Responding to South Africa's ICT Skills Crisis

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Abstract

Advancement in digital technologies has directed the attention of developing countries toward ICT's to aid socio-economic advancement. These technological solutions cannot be implemented as an island, and its effective use requires proportionate advancement in local ICT skills levels to ensure effective operation and sustainability. Increasingly demands for skilled ICT workforce globally is placing pressure on institutions to be more responsive, and to produce ICT graduates with a skillset that is more relevant and closer aligned to the needs of industries.

In South Africa the ICT skills landscape remains an object of conflicting reports. Depending on who the question is posed to, the paradoxical views describe the country as either facing a critical shortfall of skilled ICT professionals, or that droves of qualified ICT professionals cannot find suitable employment. These contradictory notions suggest a possible mismatch between the current skills of ICT professionals, the supply of appropriately skilled ICT graduates by education institutions and industry demands for appropriately skilled ICT workforce. Attempts to reform the country's skills landscape has resulted in numerous policy pronouncements and skills development strategies by the public and private sectors with limited success.

This focus of this study was to evaluate the National Certificate Vocational Information Technology (NCV IT) strategy, an ICT skills development mandate issued to South African Technical and Vocational Education and Training (TVET) Colleges in response to the country's ICT skills shortage. Using the Design-Reality Gap Model, the study evaluated the intended design objectives and current reality of NCV IT to gauge its status ten years post inception. While the South African government boasts increasing access to the programme, little focus is given to the handful of graduates who successfully complete the programme and even less who find meaningful employment. The study further operationalised the Design Reality Gap Model to demonstrate its applicability and value in the evaluation of Vocational Education and Training (VET) programmes.

Primary data informing the study was from focus group discussions and semi-structured interviews with key NCV IT stakeholders. Secondary data supporting the study was collected by reviewing key documents relating to NCV IT. The findings reveal significant gaps exist between the programme's intended design and current reality, indicative of the key challenges hindering the effective delivery of its ICT skills promise. It further positions the NCV IT programme as a post-apartheid dumping ground for financially disadvantaged and academically underperforming individuals hoping to achieve self-sufficiency. What was envisaged to be an enabler for the country's ICT skills development has instead become a black hole for public funding yielding no return on investment. Recommendations were suggested along particular structural dimensions to improve the NCV IT programme, and the development of a more effective vocational ICT skills development strategy.

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Completing a Master's degree alongside a myriad of other commitments was indeed the most difficult thing I have ever done in my life. I herewith express my utmost gratitude to the Almighty, for bestowing upon me the courage to begin this dissertation, and the patience to see it through until its very end. The best piece I have read during my studies was the profound quote of Confucius that I hope will inspire others like myself who tread the path of seeking knowledge:

"It does not matter how slowly you go as long as you do not stop."

-Confucius

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Acronyms and Terminology

Abbreviation	Description
ACM	Association for Computing Machinery
DBE	Department of Basic Education
DHET	Department of Higher Education and Training
FET	Further Education and Training
FETI	Further Education and Training Institute
HRDSA	Human Resource Development Strategy of South Africa
ICT	Information and Communications Technology
ICT4D	Information and Communications Technology for Development
IT	Information Technology
JSCE	Johannesburg Centre for Software Engineering
MICT	Media, Information and Communication Technologies
NCHE	National Commission for Higher Education
NCV	National Certificate (Vocational)
NDP	National Development Plan
NRI	Network Readiness Index
NSDS	National Skills Development Strategy
NSFAS	National Student Financial Aid Scheme
SA	South Africa
SAQA	South African Qualifications Authority
TVET	Technical and Vocational Education and Training
UNESCO	United Nations Educational, Scientific and Cultural Organization
USA	United States of America
UMALUSI	Quality assurance authority for General and Further Education and Training in South Africa
WCED	Western Cape Education Department
VET	Vocational Education and Training

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This chapter provides a background to the study, highlights its problem statement and the rationale for its pursuance. It proceeds to discuss the study's aims and objectives and the research approach followed. The chapter closes with a brief overview of each of the subsequent chapters in the study.

1.1 Background

ICT's have diffused rapidly into developing nations and are widely accepted as an enabler for socio-economic advancement (Avgerou, 2010). Its adoption in commerce is driven by digital disruption and changes in both the way goods and services are supplied and their consumer demands (PwC, 2016). It has been instrumental in creating economies that are more globalised than ever before and aids the narrowing of geographical boundaries which previously limited the reach of health, education and government services among others.

The effectiveness and sustainability of ICT driven socio-economic development initiatives demands the implementation of ICT's supported by a workforce with current and diversified ICT skills sets (Bass & Heeks, 2011). A survey conducted by IBM (IBM, 2014) indicates even though 87% of African ICT leaders recognise the importance of emerging technologies, only 34% are adopting them, and largely attribute it to the lack of ICT skills or the inability to attract and retain appropriately skilled ICT professionals. The findings of the survey further revealed that less than 50% of the surveyed companies developed the adequate level of ICT skills needed to bridge the technology gap.

Plaatjies and Mitrovic (2014) estimated the ICT skills shortage in South Africa to be in excess of 70 000 ICT professionals and is affirmed by the fact that advertised ICT positions are not easily filled (Tanner & Seymour, 2014). The contrasting argument to the ICT skills shortage is that even though there is supply of ICT skills by education and training institutions, graduates struggle to find appropriate employment (Statistics South Africa, 2017). Among the reasons cited is that multinational organisations continue to hire and retain already trained professionals who possess instantaneously usable and transferable ICT skills (Plaatjies & Mitrovic, 2014). These opposing views form the basis of a possible mismatch between the country's demand for skilled ICT workforce and its supply. The result of such an ineffective ICT sector raises concerns about South Africa's ability to attain its national development goals, its success in the adoption of international development plans, and its effective participation in the volatile and rapidly evolving global technology market (Plaatjies & Mitrovic, 2014). This prompts the supply of ICT skills by institutions to be reconsidered, and for an ICT skills system that is more responsive to the needs of the economy. The country's skills shortage in general coupled with its strong association with the

“How can there be both, a dire lack of ICT skills and poor employment prospects for ICT graduates? Does the blame rest with education institutions, a lack of industry input or something else entirely?”

protracted and high levels of poverty of its citizenry has seen the pronouncement of a host of government policies and skills development strategies, many of which enjoy only limited success (Akoojee, 2009). Recent years have witnessed a returning interest among the international policy community in the role of TVET in national development (Baraki & Kemenade, 2013; McGrath, 2012). Regardless of the academic orthodoxy questioning its contribution (McGrath, 2012) the former sentiments have cascaded down to a national policy level with vocational training at TVET institutions being bolstered by the South African government in an attempt to remedy much of the country's skills development and unemployment concerns (NDP, 2012).

NCV programmes were introduced in South Africa as a democratic government funded initiative, to be executed by Further Education and Training (FET) Colleges, now rebranded as TVET Colleges. The introduction of the NCV programmes was a direct response to the shortage of occupational skills within the country (Adams, 2011). These programmes spanned across several priority sectors, including the IT sector (Adams, 2011; Papier, 2009). The goals of the new NCV strategy was to transition students from compulsory secondary education via an accelerated path into priority sectors in higher education institutions or to provide them with the requisite vocational skill set to enter the world of work. The questionable progress of the NCV strategy early after its inception prompted an evaluative study (Papier, 2009) to investigate the poor performance of the initial cohort of learners graduating from the programme. Though the study reported findings broadly across a range of NCV programmes, no known reports of research investigating the NCV IT programme specifically and its progress to date are available. This follow up study aims to evaluate the status of the NCV IT programme at present and delve into understanding the structural challenges the programme faces in the execution of its ICT skills development mandate.

1.2 Defining evaluation

Evaluation is “the systematic and objective assessment of an ongoing or completed project, programme or policy, its design, implementation and results. The aim is to determine the relevance and fulfilment of objectives, development efficiency, effectiveness, impact and sustainability” (OECD, 2009).

Table 1: Objectives of the evaluation process (OECD, 2009)

Objective	Description
Relevance	Measures extent to which an intervention is suited to the priorities of the target group
Effectiveness	Measures extent to which an intervention attains its objectives
Efficiency	Measures the outputs in relation to the inputs
Impact	Measures the positive and negative changes produced by an intervention
Sustainability	Measures whether the benefits of an intervention are likely to continue

Heeks (2002) explains evaluation as a subjective endeavour where different findings may be reported on the same phenomena based on the perspective from which it is being evaluated. Evaluating an entity requires benchmarking against a particular expectation or set criteria

and should have specific objectives. In this study we evaluate the effectiveness of the NCV IT programme, through benchmarking its current implementation realities against its intended design objectives to measure the extent of achievement or non-achievement of its intended design.

1.3 Why evaluate VET programmes?

Evaluating education programmes allow stakeholders to assess new programmes introduced, to gain an understanding whether it has been implemented as designed and what effect the programme has had on student achievement and behavior (Anderson & Postlethwaite, 2007). Pawson and Tilley (1997) cited in (Baraki & Kemenade, 2013) suggest that evaluation demonstrates what about the programme works, for whom and in what conditions. In this context, evaluation becomes an increasingly important factor, as it is one way to improve the effectiveness of vocational IT education in South Africa and helps identify intervention required to support its objectives. Comprehensive VET evaluations are often not implemented in a systematic manner by either the public or private sector in many countries (Fretwell, 2003) and having a framework to guide this study's evaluation process is thus invaluable. If communicated to stakeholders, the results could improve the NCV strategy and its IT programme.

1.4 Problem statement and research questions

The NCV programmes were formed in direct response to the shortage of occupational skills in the country (Adams, 2011). It aimed to respond to the South Africa's industry skills demands and simultaneously provide skills for improving employment prospects among unemployed youth. Ten years post the inception of the NCV IT programme, the issue of an ICT skills shortage in South Africa remains evident (JCSE, 2016), while graduates from the programme remain largely unemployed or employed within occupations outside of their fields of specialization. The South African government continues to inject millions of rands into the support of VET programmes with no formal evaluation indicating a return on investment, particularly within the country's ICT sector. It was the assumption of the researcher that the limited success of the programme's ICT skills mandate is due to gaps that exist between NCV IT's intended design and its current reality. It was therefore important to evaluate the extent to which the NCV IT programme is achieving its intended objectives, and identify barriers hindering its progress to ensure the long term success of the NCV IT strategy. The research question posed primarily asked, **'What factors hinder the NCV IT programme in achieving its ICT skills development mandate?** To aid in answering the primary research question, it was useful to consider the following sub questions:

1. What was the intended design of the NCV IT programme ?
2. What is the current reality of the NCV IT programme?
3. What gaps exists between the design and reality of the programme ?
4. What are the implications of these gaps?

1.5 Research aims and objectives

The research questions suggested the following objectives for the study.

1. To identify the NCV IT programme's intended design objectives and reality at present.
2. To analyse gaps between the programme's design and reality.
3. To determine the implications of these design-reality gaps.

1.6 Summary of research approach

To answer the research questions posed in this study, we employed a descriptive case study research strategy due to its strength in studying phenomena in its real life context. A single case was drawn from South Africa's Western Cape Province, a TVET college at which the researcher was employed. The researcher acted as a practitioner researcher and is described by Oates (as cited in Dasuki, Ogedebe, Kanya, Ndume and Makinde, 2015) as somebody who is employed in an organisation and conducts research into their own work context. The position that all NCV IT programmes offered at TVET colleges across South Africa share common objectives as set by the country's Department of Higher Education and Training (DHET) and duly governed under their single administration, affirms the shared context in which NCV IT operates. Furthermore generalisations from the case to a population was not sought as an objective for the study, but rather to understand the deeper structure of challenges around the NCV IT programme.

The Design-Reality Gap Model (Heeks, 2002) was adopted as the lens to guide the study, providing insight into which issues were important to examine and measure, and the method for data collection and analysis. Other studies that adopted the case study approach while utilizing the Design-Reality Gap Model include Bass and Heeks (2011) in evaluating changing computing curricular in Ethiopian higher education, Baraki and Kenemede (2013) in evaluating the effectiveness of TVET in Ethiopia, and Dasuki et.al (2015) in evaluating changing computing curricular in African universities. The study assumed gaps exist between the government's intended design of the NCV IT programme and the reality of NCV as experienced by its stakeholders at present. Hence the applicability of the Design-Reality Gap Model. These gaps were explored through the models OPTIMISM constructs to reveal inherent challenges within the programme known as design-reality gaps, and to gain an overall account of the programme's state at present.

Data sources consulted included focus group discussions and semi-structured interviews with key NCV IT stakeholders and ICT industry representatives, and an analysis of key documents discussing NCV IT's design and reality. The study followed an interpretivist strategy and employed a qualitative approach to data collection and analysis. This decision was justified by the framework being one that relies heavily on a participatory approach in which all key stakeholders are to be consulted and is in line with similar studies that adopted the model. Furthermore it was found to be most appropriate for executing the studies objectives in answering the research questions posed.

1.7 Research contribution

As pressure mounts with the introduction of South Africa's National Development Plan 2030 (NDP, 2012), there are greater expectations from the skills development system to work more efficiently in delivering skills required by the economy (MICT, 2013). The extent of the design-reality gaps revealed is indicative of the NCV IT programme's success or failure at present (Heeks, 2002) and allowed recommendations to be made to increase the likelihood of the programme's long term success. The findings aimed to contribute to practice through informing TVET policy makers and key stakeholders of current challenges of the NCV IT programme along particular structural dimensions. This practical contribution could form a basis for improvement in the programme and act as a reference for NCV IT policy makers to facilitate policy review and planning in the TVET space. In this respect the research supports the objective laid out by the South African Government in its National Development Plan 2030 (NDP, 2012) to improve the quality of education in TVET's. It was also noted that no literature could be located that specifically discussed vocational IT education. The study therefore aimed to contribute to theory by building on the existing TVET body of knowledge, while simultaneously operationalising the Design-Reality Gap Model as an evaluative framework for evaluating vocational education and training programmes.

1.8 Overview of chapters

The structure of the rest of the thesis is as follows:

Chapter 2 explores the available literature on the twin issues of an ICT skills shortage and skills development in South Africa's ICT sector, with a specific focus on vocational education as a change agent.

Chapter 3 presents the core conceptual framework – the Design-Reality Gap Model which underpinned the evaluation of the NCV IT programme's implementation. Justification for the selection of the framework is discussed along with consideration of other evaluative frameworks.

Chapter 4 describes the research methodology employed and justification for the selection of research method. Data collection and analysis techniques, research instruments utilised, ethical factors and time horizons are also presented in this chapter.

Chapter 5 summarises key findings and attempts to answer the research questions and meet research objectives. Key findings emerging from the data are summarised. It discusses the findings more generally and implications for the literature that was reviewed for the study.

Chapter 6 is the conclusion and summarises the answers to the research questions posed. It reviews the extent to which the study's objectives and results have achieved the theoretical and methodical aims. A reflection on the theoretical framework employed is presented. The chapter also presents recommendations to practice and the direction that further research should pursue.

This chapter commences with an overview of the skills development landscape in South Africa. It proceeds to highlight the growing importance of ICT skills in the country's socio-economic development and provides an overview of the reported ICT skills shortage. It concludes with a discussion on vocational IT education as a response to the ICT skills demand.

2.1 Skills development in South Africa

2.1.1 New South Africa - post 1994 period

Transitioning to power in 1994, the new democratically elected South African government inherited a nation severely affected by socio-economic imbalances. A nation who during its apartheid era was isolated from the rest of the world through internationally imposed sanctions, and socially divided by its racially motivated apartheid ideologies (Kearney & Odusola, 2011). The impact of these ideologies on the country's education sector dictated what non-whites (black's, coloured's and Indian's) were able to study, where they were able to study and ultimately the type of work they were able to do (Badat, 2008). Post-Apartheid, the new government committed to reparation resulting in a plethora of policy pronouncements including redress in the education sector. Formulation of legislation such as the Higher Education Act (1997), coupled with the National Education Policy Initiative (1993) and the establishment of a National Commission for Higher Education (NCHE) laid the foundation for a more efficient and equal education system (Odhav, 2009). Reformation attempts underway were not only limited to the education sector and extended to the labour market through the Employment Equity Act No. 55 of (1998), ensuring that suitably qualified people from designated groups have equal employment opportunities.

South Africa's more recent development agenda directed by the National Development Plan 2030 (NDP, 2012) has at its core, the obligation to reduce chronic levels of poverty among its citizenry and eliminating the traces of historic inequality resulting from the apartheid regime. The NDP 2030 advocates that to provide citizens with a life that they desire, key capabilities need to be established at a country-level and individual-level, capabilities including safety and security, housing, healthcare, etc. "Of these capabilities, education and skills and the opportunity to work are the elements where South Africa most needs to make progress" (NDP, 2012, p.28). These sentiments were retained from earlier directives such as the country's National Skills Development Strategy III (NSDS III). The NSDS III advocates investment in education, training and skills development to achieve high levels of economic growth and to address the social challenges of poverty and inequality through creating a skilled and capable workforce to support an inclusive growth path.

2.1.2 Contemporary South Africa - post 2010 period

Despite the plethora of policy pronouncements and initiatives around skills development, success was limited, while poverty and unemployment remain rife and key challenges facing

contemporary South Africa (Akoojee, 2009). According to the Quarterly Labour Force Survey (Statistics South Africa, 2017) the unemployment rate in South Africa increased to 27,7% in the first quarter of 2017 up from 22% in 1994. Although improved access to education has been an outstanding theme of South Africa's transformation, the quality of education and its impact on unemployment and poverty remains one of the country's biggest constraints. Badat (2008) discusses this very disjoint, contending that reformation relating to 'access to education' and 'quality of education' cannot exist in isolation to creating work opportunities. More than twenty years post-apartheid, the South African government remains focused on rectifying prior injustices, while a growing need exists to pay closer attention to development outcomes of its industries and the need to remain relevant in today's volatile and demanding global digital economy.

2.2 (Re) Defining the ICT discipline

The 21st century has seen a fundamental shift in society, progression from an industrial society to an information society (Lunt et al., 2008) largely driven by digital computing technologies. Computing technologies have become integral in driving social and economic advancement, and the primary cause for digital disruption in business models and labour dynamics in the 21st century (JCSE, 2016). The extensive use and impact of digital technologies today has given rise to the "fourth industrial revolution" (WEF, 2016). Synonymously referred to as Information and Communications Technologies (ICT's), they continue to evolve at an astonishing pace with new technologies being introduced continually, and existing ones becoming obsolete almost as soon as they appear. ICT's are not just revolutionising the world but revolutionising itself with advancements in one area having a knock on effect in another.

Rapid advancement in ICT's pose a major methodological problem in defining ICT occupational needs. What could previously be referred to as an ICT industry now sees the lines blurred with virtually every economic sector overlapping with and largely dependent on ICT's, each with its unique mix of ICT skills needs (Akoojee, Arends & Roodt, 2008). Understanding ICT occupational needs requires an understanding of the ICT discipline itself. The Association for Computing Machinery (ACM) defines IT as:

"Information Technology (IT) in its broadest sense encompasses all aspects of computing technology. IT, as an academic discipline, is concerned with issues related to advocating for users and meeting their needs within an organizational and societal context through the selection, creation, application, integration and administration of computing technologies." (Lunt et al., 2008, p.9)

Although all computing disciplines are often broadly referred to as ICT. IT is an academic discipline of its own, alongside Computer Science, Computer Engineering, Software Engineering and Information Systems (Tanner & Seymour, 2014). Table 2.1 contrasts the focus of these various computing disciplines commonly referred to as ICT.

Table 2.1: Overview of the Computing discipline (Adapted from Tanner & Seymour, 2014)

Computing Discipline	Explanation
Information Technology	The application, deployment and configuration aspect of computing. Focuses on the needs of end users within organisations and society through the selection, creation, application, integration and administration of computing technologies.
Computer Science	Designing and building software, developing effective ways of solving computing problems, and devising innovative ways of addressing challenges through the use of computers.
Information Systems	Concerned with the information that can be obtained from computer systems to enable organizations in identifying and meeting their goals. It is also concerned with the identification of business processes that companies can implement and improve on through information technologies.
Computer Engineering	The design and construction of computer-based systems and computers in general. It relates to the study of hardware, software and the interaction and communication between them.
Software Engineering	Focuses on the reliable, efficient and affordable development and maintenance of software systems.

To focus on the real issue of an overall computing skills shortage in South Africa this study adopts in its definition of ICT skills, any skills requirements from the aforementioned computing disciplines.

2.3 Information and Communication Technologies in South Africa

2.3.1 South Africa's ICT market

The rapid growth of digital economies globally means ICT skills will play a more important role in SA's economic health than ever before. South Africa has seen a reasonably sophisticated ICT sector emerge over the last two decades (Gillwald, Moyo & Stork, 2013) despite claims (JCSE, 2014) that it's falling behind its peers Kenya, Nigeria and Egypt who place greater importance on the contribution of technology in economic growth. An opposing view suggests ICT spend in South Africa will reach \$10 billion by 2017 topping ICT spending in the entire Mideast, Turkey and Africa regions (IDC, 2013). The World Economic Forum's Networked Readiness Index (NRI) measures how well an economy is using information and communications technologies to boost competitiveness and well-being. The 2016 World Economic Forum NRI ranks South Africa as 65th out of 137 countries for ICT adoption, up ten places since 2014.

Irrespective of these strides, South Africa continues to demonstrate characteristics of both an advanced and developing economy (Gillwald, Moyo & Stork, 2013). Characterised by the early adoption of cutting-edge technologies by high-income users, while simultaneously seeing the majority of the population, the public sector, and smaller enterprises reflecting

slower adoption patterns typical of developing countries. As business outcomes and the need for digital transformation grow, the “wait-and-watch” period between the developed and developing world draws to a close. As a result, the need for skilled ICT workforce to drive technological solutions in South Africa is exponentially increasing.

2.3.2 Role of ICT's in South Africa's development

Brown and Grant (2010) distinguish between ICT use in developing countries and the use of ICT's for development. The former utilises ICT's for economic benefit, and may not necessarily contribute to the empowerment of underprivileged communities (Walsham, 2013), while the latter emphasises the theorising and application of ICT's to contribute to the improvement of socio-economic conditions (Heeks, 2006). Research on ICT for development (ICT4D) are based on the premise that ICT's potentially have the capacity to contribute towards improving various aspects of life, ranging from the reduction of poverty to the support of democratic politics (Coelho & Segatto, 2013). Similar sentiments are echoed in South Africa's NDP 2030 (2012, p.170) stating “ICT will continue to reduce spatial exclusion, enabling seamless participation by the majority in the global ICT system, not simply as users but as content developers and application innovators”. Another key interest in the ICT sector at the highest levels of government in South Africa has much to do with its potential to contribute to job creation in the country (Lotriet, Matthee & Alexander, 2010; SACF, 2009; Akoojee, Arends & Roodt, 2008). Increasingly rapid organisational and ICT innovation occurring in the developed world forces developing countries to follow suite to effectively participate in the globally competitive digital economy (Avgerou, 2010). ICT's are widely accepted to be an enabler of socio-economic development (Heeks, 2016) and without the contribution of a fully effective ICT sector the goals of South Africa's NDP 2030 cannot be achieved (JCSE, 2014)

2.4 South Africa's ICT skills demand

There exists a general sense in the literature (Lotriet, Matthee & Alexander, 2010; Tanner and Seymour, 2014; JSCE 2016; MICT SETA Sector Skills Plan, 2013; National Scarce Skills List 2014) that South Africa is experiencing an ICT skills shortage. While there appears to be a growing demand by the labour market for skilled ICT workforce, other reports indicate a growing number of ICT graduates who cannot find suitable employment in the field. This paradox prompts the need for further analysis into ICT skills demand and supply in South Africa.

In 2008, South Africa's Department of Labour indicated in its National Master Scarce Skills List that a minimum of 37,565 IT professionals were needed in the ICT sector (Calitz, 2010). In the 2009 the ITWeb survey estimated skilled ICT professionals needed in South Africa to be nearly 70,000 (Calitz, 2010). Corroborating figures have been reported by Plaatjies & Mitrovic (2014) reporting statistics of 70,000 plus ICT professionals to be in short supply in the country. Reports on developed countries ICT skills shortages appear no different, Australia's IT workforce requirements indicates a 5% growth in the number of its ICT professionals to 600 000 in 2014 with a further demand for 100 000 workers over the next six years (Australian Computer Society, 2015). The USA Department of Labour project 800,

000 to 1.5 million computing jobs between 2010 and 2018 (Calitz, 2010). To make sense of South Africa's reported ICT skills shortages, it was necessary to establish the level of ICT skills in demand and the nature of the reported ICT skills shortages rather than considering only aggregated figures reported.

2.4.1 Nature of South Africa's ICT skills shortage

The National Scarce Skills Plan published by South Africa's Department of Higher Education and Training (DHET) defines scarce skills as "those occupations in which there are a scarcity of qualified and experienced people, currently or anticipated in the future, either (a) because such skilled people are not available or (b) they are available but do not meet employment criteria" (NSSL, 2014, p.5). From this statement a number of factors are deduced that impact on South Africa's ICT skills shortage:

- ICT qualifications requirements
- ICT experience requirements
- Other employment criteria (possibly referring to legislative equity criteria)

The Gauteng ICT strategy (n.d.) discusses ICT skills shortages across varying levels:

- ICT skills needed for modern day life outside the workplace (digital literacy)
- ICT skills in the workplace to respond to changes in business processes and industry structures (e-skills)
- Technical skills for the ICT specialists needed in ICT and related jobs in industry

This study specifically refers to higher level ICT skills needed by specialist ICT professionals to contribute productively to the ICT sector, rather than lower level ICT literacy skills that the ordinary citizen needs to participate fully in the information society. It is however acknowledged that many studies in fact report a shortage of skills within the lower level ICT literacy skills (Plaatjies & Mitrovic, 2014) but falls outside the scope of this study. The DHET's most recent 'LIST OF OCCUPATIONS IN HIGH DEMAND: 2015' (DHET, 2016) identified the top 100 occupations considered to be in short supply in South Africa. It makes specific reference to ICT skills shortages by occupation across three levels; management, professionals and technicians or associate professionals. Although there is a skills shortage on the top-level and low-level skills bands, the report indicates that the greater ICT skills needs fall within the mid-level professional skills band indicated in Table 2.2.

Table 2.2: ICT skills levels (Adapted from (List of Occupations in High Demand (2015))

Management
Chief Information Officer
ICT Project Manager
Professionals
IT Teachers
ICT Systems Analyst
Software Developer
Programmer Analyst
Database Designer and Administrator
Computer Network and Systems Engineer
Network Analyst
ICT Security Specialist
Technical (ICT) Support Services
Technicians and associate professionals
Computer network technician

Discourses on the skills deficit in South Africa misleadingly present 'high skills' as a priority investment for economic growth, while the skills problem equally exists at an intermediate and low skills level (Lewis, 2006). These sentiments are confirmed by the South African Qualifications Authority (SAQA) stating "South Africa needs 'intermediate-level' skills and maintains that "the College sector is well-positioned to deliver in this respect and in so doing contribute to the much-needed reduction in unemployment" (SAQA, 2016, p.9). While it is evident that some sectors are largely dependent on high skills, other sectors growth are dependent on employment in the intermediate and low-skills categories. While it is difficult to establish the exact nature of ICT skills considered to be in short supply due to unique skills mixes required by various sectors, the Media, Information and communication Technology (MICT) Sector Education and Training Authority (SETA), and the Johannesburg Centre for Software Engineering (JSCE) provide some understanding of South Africa's ICT skills demands.

The MICT SETA Priority Skills List 2015/2016 (MICT SETA, 2015) in Figure 2.1 list its top 10 scarce skills across its sub sectors. The report lists the ICT Systems Analyst, Software Developer, Computer Network and Systems Engineer, and the Computer Network Technician occupations as the top scarce skills in the Information Technology sub sector. While it is likely that the aggregate figures cited as evidence of the ICT skills shortage below can hide wide variations dictated by various non-ICT sectors, it provides some indication of the ICT skills demands in the labour market and more importantly the urgency with which it should be addressed.

Occupation	2015/2016	2016/2017	2017/2018
251201 - Software Developer	998	1 343	1 511
251101 - ICT Systems Analyst	635	767	863
251203 - Developer Programmer	477	241	210
351401 - Web Technician	259	262	262
251901 - Quality Assurance Analyst (Computers)	231	233	223
242101 - Management Consultant	158	117	93
351301 - Computer Network Technician	132	127	109
133102 - ICT Project Manager	130	124	99
243401 - ICT Account Manager	99	111	88
252902 - Technical (ICT) Support Services Manager	99	111	78

Figure 2.1: ICT skills shortages in SA (Adapted from MICT SETA (2015))

In addition to the ICT occupational needs listed above, the JCSE Skills Survey highlights skills trends in the South African ICT sector and aims to identify the most urgent skills needs based on corporate perspective. Findings from its 2016 survey (JCSE, 2016) reveal the top ICT skills needs for 2017 to be Information security and Big data analytics, while there appears to be sufficient supply of Project management and Programming skills.

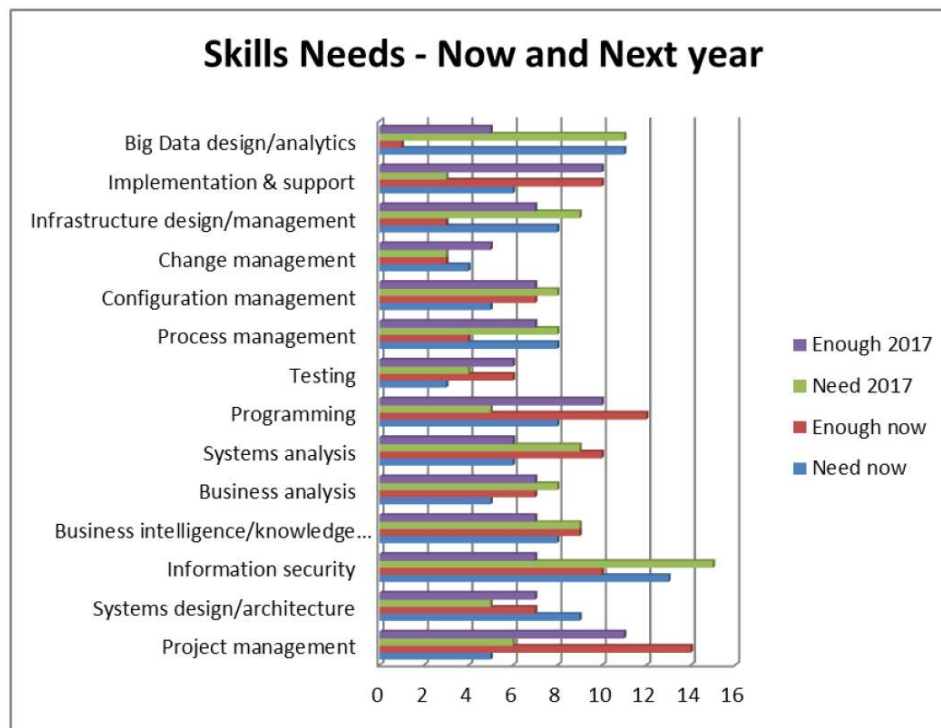


Figure 2.2: ICT skills needs in SA (JCSE, 2016)

2.4.2 Causes for the ICT skills shortage

South Africa is by no means alone in reported ICT skills shortages and many of the reasons for this are similar across different countries (Lotriet, Matthee & Alexander, 2010). Along with the issue of an ICT skills shortage, questions arise as to reasons why South Africa faces a

dire ICT skills shortage. Tanner and Seymour (2014) and Plaatjies and Mitrovic (2014) highlight the issue of brain drain, stating that South African ICT professionals are immigrating to countries offering improved salaries and opportunity. Another reason is post-apartheid policy pronouncements dictating gender, race and other requirements to be met by suitably qualified personnel. As a result candidates may be suitably qualified but do not meet the transformation criteria as dictated by government policies. This notion causes a further complication to the ICT skills crisis in South Africa, where employers now seek candidates with a unique mix of ICT skills and having to belong to a specified gender group and racial denomination (Akoojee, Arends and Roodt, 2008). Lotriet, Matthee and Alexander (2010) attribute the skills shortage to the rapid evolution of technology at an alarming pace which requires knowledge workers to continually reskill to stay abreast with new technologies, current trends and industry requirements. Akoojee (2009) refers to the expectation gap as a cause for the skills shortage, with the lack of any meaningful success in skills development resulting from the lack of synergy between the supply-side and demand-side requirements of skills in the market. This notion is concurred by JCSE (2014) contending that new and emerging technologies are creating a strong demand for certain skills sets. Yet another opinion suggests that the ICT skills gap is more of a perception than a reality, asserting that employers are seeking a unique combination of skills and experience in an individual that just do not exist (JSCE, 2016). This opinion is echoed in the IT Salary Survey (2014) stating that professionals are wearing many hats across ICT functional areas and are not easily replaced.

2.5 TVET solution to the ICT skills crisis

2.5.1 South African education system

Education in South Africa is governed by two national departments, namely the department of Basic Education (DBE), responsible for primary and secondary schooling, and DHET, responsible for tertiary education and VET. The General Education and Training (GET) band includes school Grade's R to 9, and the FET, band includes Grade's 10-12 as well as non-higher education vocational training facilities. Learners who complete the compulsory Grades R – 9, have essentially completed the basic education requirements and have at their disposal a number of further and higher education options to pursue thereafter. Among these options include:

- Remaining enrolled in a mainstream secondary school and completing Grades 10, 11 and 12. Access to a university thereafter requires a learner to have completed at least Grade 12 and met specific overall and subject performance requirements
- Enrolling at a TVET College post Grade 9 to pursue either a 'Nated' or 'NCV' programme, allowing learners to specialize earlier rather than completing the traditional school Grades 10, 11 and 12
- Enrolling in skills programmes and learning on the job

Figure 2.3 illustrates the educational paths for mainstream school learners to follow post Grade 9.

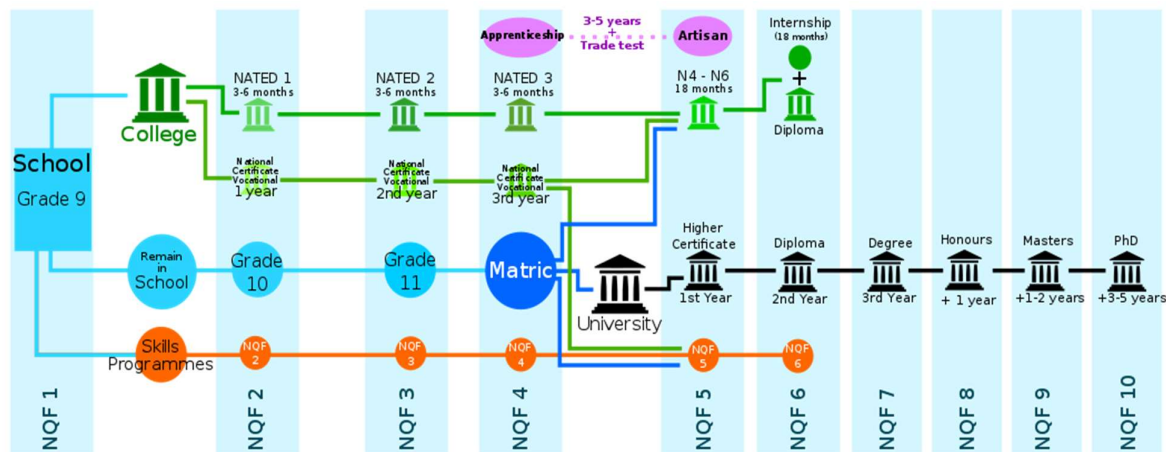


Figure 2.3: Educational options within South Africa's education system (Discott, 2017)

The new National Qualification's Framework (NQF) has aligned each education level to an NQF level with VET programmes at TVET colleges aligned to NQF levels 2,3 and 4. Another focus of the NQF was on mobility and has made allowances for prior learning to be recognised and allows learners who have chosen a particular educational path to transfer and continue along a different path providing the necessary prerequisites have been fulfilled. A major factor keeping developing countries from being able to fight poverty is the inaccessibility of higher education and training. With university education in South Africa being out of reach for many, an alternative option was required to bring education to the population. Through direct investment in TVET colleges, the South African government hoped to bring higher education to the people. By making training and skills development available to its citizenry, they hope to help people upskill and overcome historic social and economic disadvantage. The result thereof would give South Africa a more skilled workforce, put it in the position to innovate and bring new ideas to the country to combat the challenges faced and strengthen its economy.

2.5.2 Technical and Vocational Education and Training

The United Nations Educational, Scientific and Cultural Organization's (UNESCO) specialised centre for TVET (UNEVOC) details the purpose of TVET as "deliberate interventions to bring about learning which would make people more productive or simply adequately productive) in designated areas of economic activity" (UNESCO-UNEVOC, 2013, p.1).

Vocational education is defined in the National Plan for FET Colleges (2008, p.15) as:

"...those aspects of the educational process involving, in addition to general education, the study of technologies and related sciences, the acquisition of practical skills, understanding and knowledge relating to occupations in various sectors of economic and social life."

Recent years have witnessed a returning interest among the national and international policy community in TVET's role in national development (Baraki & Kemenade, 2013; McGrath, 2012). In South Africa TVET has become particularly crucial as a response to the skills and employment crisis dominating the country's national agenda (Akoojee, 2016). As a component of the South African education and training system VET was designed to respond to intermediate level skills development needs (Akoojee, 2009), and therefore paramount in the country's overall plan to respond to the skills development challenge. Anderson (as cited in McGrath, 2012) contends that VET is built on two key assumptions, (a) training leads to productivity which leads to economic growth and (b) skills lead to employability which leads to jobs. The returning interest in TVET's role in national development has been declared at a global level and imbedded in numerous global policy pronouncements aimed at contributing to national development. These interests are evident in policies such as - The United Nations Sustainable Development Goals 2015, BRICS Building Education for the Future: Recommendations for co-operation, African Commissions Agenda 2063 and South Africa's National Development Plan 2030.

Sentiments in the literature about TVET's relevance and effectiveness in addressing the skills shortage and unemployment are divided. Baraki & Kemenade (2012) contends that TVET is deemed to fail in developing countries, while McGrath (2012) highlights the academic orthodoxy in the international arena as being dismissive of TVET's contribution. Akoojee (2016) provides a more balanced perspective to TVET's contribution stating that although South Africa is at the forefront of executing global policies and models, its TVET strategy should be strategically repositioned to match local context while acknowledging its contextual realities rather than that of the international community. It is during periods of educational change and reform that gaps have often been noted, largely as a result of the disconnect between policy-makers' stated intentions and the actual experience of the learners (Liu and Clayton (2016). To better achieve its ICT goals, South Africa must have a coordinated enabling ICT strategy and plan, coupled with an effective ICT skills development strategy.

2.5.3 Role of TVET in the ICT skills crisis

While government refers to a skills shortage in terms of numbers and types of professionals, there also exists a skills deficit in terms of the quality of output from education institutions contributing significantly to the relatively uneven levels of graduate unemployment (Lewis, 2006). TVET colleges offering the NCV IT programme are thus required to be responsive to the technical demands of the IT sector and to produce graduates whose skills are aligned to the real needs of industry (Calitz, 2010). While TVET colleges and universities may well be a primary education option for the pre-employed hoping to pursue a career in ICT. The current ICT working class equally requires continuous training to remain relevant in the rapidly changing ICT landscape. Findings of the JCSE (2016) survey indicate e-Learning and knowledge sharing among peers in the workplace to be the leading forms of training for employers followed by vendor based certifications and formal training at academic institutions.

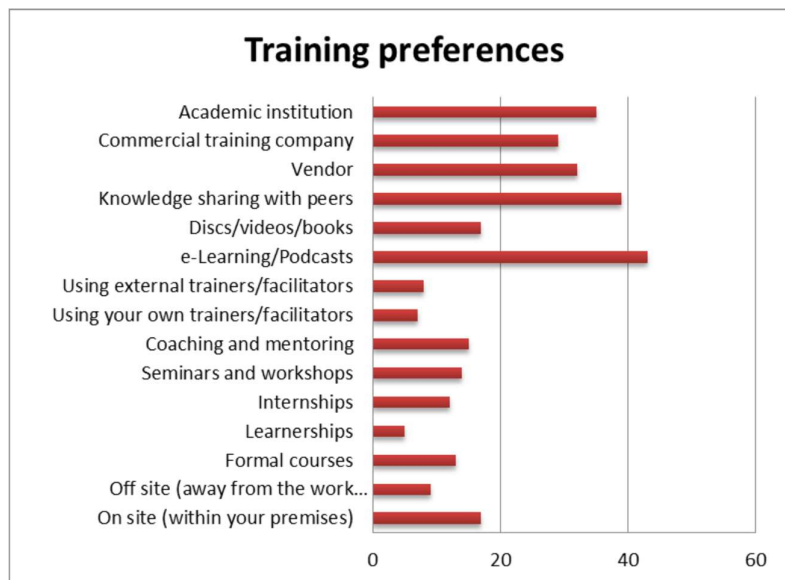


Figure 2.4: Preferred methods for ICT training (JCSE, 2016)

2.6 Chapter summary

A frequent point of departure with discourses discussing the issue of a skills shortage is the inability of education and training institutions to produce suitably qualified graduates. From the literature reviewed, it is evident that there is a dire need for intermediate level ICT skills in South Africa and the need for educational institutions to respond accordingly. Whether VET is a game changer and an effective means for addressing the current and future intermediate ICT skills workforce demands is questionable. A key question that has been left unanswered by the literature is – has Vocational IT education in South Africa been effective in addressing the IT sector’s development needs to boost the South African economy, or is the NCV IT programme another wasteful system not serving the country’s human resource needs. The chapters that follow investigate these sentiments and outline the framework and methodology employed to answer the research questions posed around the intended design and current reality of vocational IT education in South Africa.

3

Chapter Three: Theoretical background

This chapter outlines the theoretical background underpinning the study. The theoretical framework was adopted as a lens to guide the study and provided insight into which issues were important to examine and measure, how it should be measured, the method for data collection and analysis and also how the final written accounts were to be reported. This chapter discusses common frameworks used in VET evaluation and focuses on the Design-Reality Gap Model as the framework of choice.

3.1 How to evaluate VET programmes

To understand how to approach the evaluation and ensure its theoretical robustness, the researcher reviewed suggested guidelines from literature on VET evaluation (Burnette & Clarke, 1999; Fretwell, 2003; Liu & Clayton, 2016) and ICT programme evaluation (Bass & Heeks, 2011; Kanya & Good, 2013). Table 3.1 summarises the course evaluation frameworks considered in this study.

Table 3.1: Course evaluation frameworks

Model /Framework	Study Output	Focus of the framework
Burnette and Clarke's model (1999)	Model for the evaluation of VET courses	Who should be involved in the evaluation? What data should be collected? How data should be collected?
Fretwell's framework (2003)	Framework for the evaluation of VET	Considers evaluation from two perspectives – evaluation of programme internally by examining inputs and externally by examining outputs.
Liu and Clayton's framework (2016)	Framework for measuring TVET efficiency	Evaluation based on: <ul style="list-style-type: none"> - Successful completion of programme - Learner retention rates - Progression to higher levels
Design-Reality Gap Model (Heeks, 2011)	Model for evaluation of higher education computing programmes in universities	Compares programmes intentions and stakeholder experiences. Allows the programme to be evaluated from various dimensions to identify design-reality gaps.

Fretwell (2003, p.2) provides guiding principles for the evaluation of VET programmes stating, "Before embarking on an evaluation, there must be agreement on what VET is and is not, so that achievement of these objectives can be measured. If there are no stated VET

policy and programme objectives, then evaluation cannot go forward effectively”. It was therefore necessary to firstly understand VET in the South African context and identify the objectives the designers of the programme had in mind at its inception. The goals, objectives and target groups for VET vary by country and are usually derived from the institution’s policy statements that need to be translated into measurable entities used to gather data on how well an institution is meeting its goals (Burnett & Clarke, 1999).

Liu and Clayton (2016) also highlight the importance of policy consideration during VET evaluation stating that there is often a gap or disconnect between policy intent and classroom reality. These sentiments are echoed by (Pak Tee, 2008) arguing that in periods of educational change and reform it has been noted there is often a disconnect, between policy-makers’ stated intentions and the actual experience of the learners when that policy is implemented. Government initiatives are often met by responses at other levels of the education system which may not be aligned with the rhetoric of the reform. Introduction of new education programme’s are therefore subject to a process of mutual adaptation, where the intentions of its designers at one level in the education system are reinterpreted to a greater or lesser extent by the implementers at the next level, and subsequently down the line, resulting in a possible gap between design and reality (Pak Tee, 2008). A main activity of this study is therefore to identify specific gaps existing between NCV IT’s design intentions and its realities at present.

In addition to policy considerations, it is important to evaluate other related inputs and output, but often one or the other is lacking. Fretwell (2003) cautions that focus should not only be on output measures and proposes two general perspectives to evaluate VET- examining internal inputs and external outputs, as they relate to stated policy and programme objectives (see Figure 3.1). Internal inputs to consider include considerations around teacher performance, teacher qualifications, resources, etc. while the external outputs consider the socio-economic impact of the programme for example, the employment of the programme’s graduates.

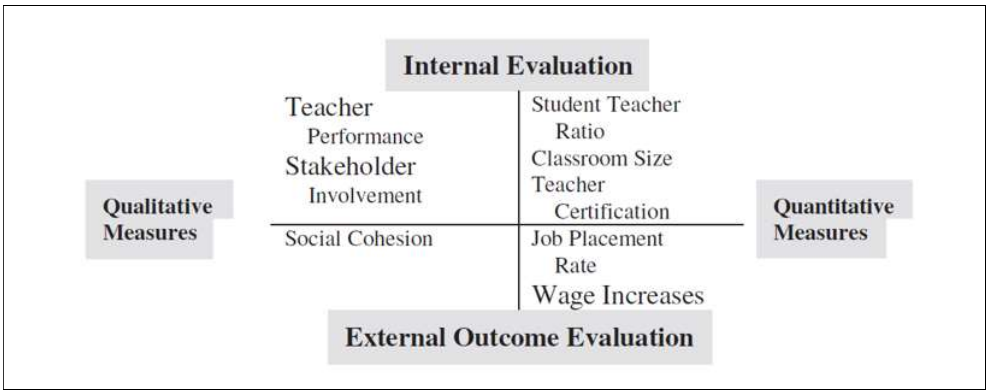


Figure 3.1: VET evaluation measures (Fretwell, 2003)

Burnette and Clarke's model (1999) suggestions that VET evaluation should involve the groups below, arguing that they all have a vested interest, and can provide relevant data specific to their particular situation:

- Students
- Graduates
- Teachers
- Employers and representatives of Industry

Different stakeholders often have different backgrounds and interests with their perspective and expectations regarding the intervention being very different. This is important to ensure that a programme addresses the needs of its various stakeholders. Further to who to include in an evaluation, the model (Burnette & Clarke, 1999) suggests what information to consider in a VET evaluation:

- target groups' perceptions of satisfaction with the quality of instruction
- the resources and facilities
- course design and delivery
- student expectations
- learning outcomes
- indication of overall satisfaction
- indices of student progress, attrition and completion rates
- graduate employment

Anderson and Postlethwaite (2007, p.1) also discuss information required to be collected during a programme evaluation and include information about the characteristics, activities, and outcomes of programs.

Table 3.2: Core concepts in evaluation (Adapted from Anderson & Postlethwaite (2007))

Concept	Definition
Characteristics	<ul style="list-style-type: none"> - Context in which the programme is operating - Resources used to support the programme - Staff used to implement the programme
Activities	<ul style="list-style-type: none"> - Actions required to implement the programme properly - Instructional strategies
Outcomes	<ul style="list-style-type: none"> - Impact of programme on its intended stakeholders

3.2 Design-Reality Gap Model: Background

The Design-Reality Gap Model Developed by Heeks (2002) is a general framework for the analysis of change which has been particularly applied to cases involving ICT projects in developing countries. The model was drawn upon from the literature on contingency in organisational change and social construction of technology (Dasuki et al., 2015). It serves as a monitoring and evaluation tool for ICT4D projects, especially e-government projects pre, during and post implementation. The model can be applied as a risk analysis tool in which the design and reality of a project are assessed cross-sectionally, at a particular

moment in time during project implementation. Larger design-reality gaps indicate a greater risk of project failure (e.g. Macias-Garza and Heeks, 2006; Hawari & Heeks, 2010). Equally, the smaller the gap, the greater the chance of success. The model can also be applied as a project evaluation tool, in which, design and reality are assessed longitudinally; with the expectations within the design compared to the reality some time later after implementation. This enables assessment of the extent of success or failure of a project, and also identification of those areas in which challenges exist. This study adopts the latter approach with the hope of revealing challenges in the programme and to gain insight into corrective measures for a revised NCV IT strategy. The model suggests that particular assumptions and requirements are built into the design of any organisational change. In turn, those design expectations may match or mismatch the real situation found in the context of implementation; hence creating the potential for a gap between design and reality. The “gap” often occurs due to project designers and project beneficiaries being distant in respect to socio-economic and cultural dimensions.

3.3 Constructs for Design-Reality Gap Model

Heeks (2003) applied the model as a risk analysis tool in the evaluation of an e-government project consisting of seven constructs or dimensions. Although the dimensions included in the model were considered to be most befitting for measuring the design-reality gaps for an e-government system, Heeks (2002) advocates that dimensions could be altered through complete replacement or the introduction of sub categories within a particular dimension to create a set of dimensions best suited for the evaluation of the phenomena being assessed. A later study by Bass and Heeks (2011) therefore included an eight dimension “milieu” (Illustrated in Figure 3.2) in their assessment of a university computing programme’s curriculum needs.

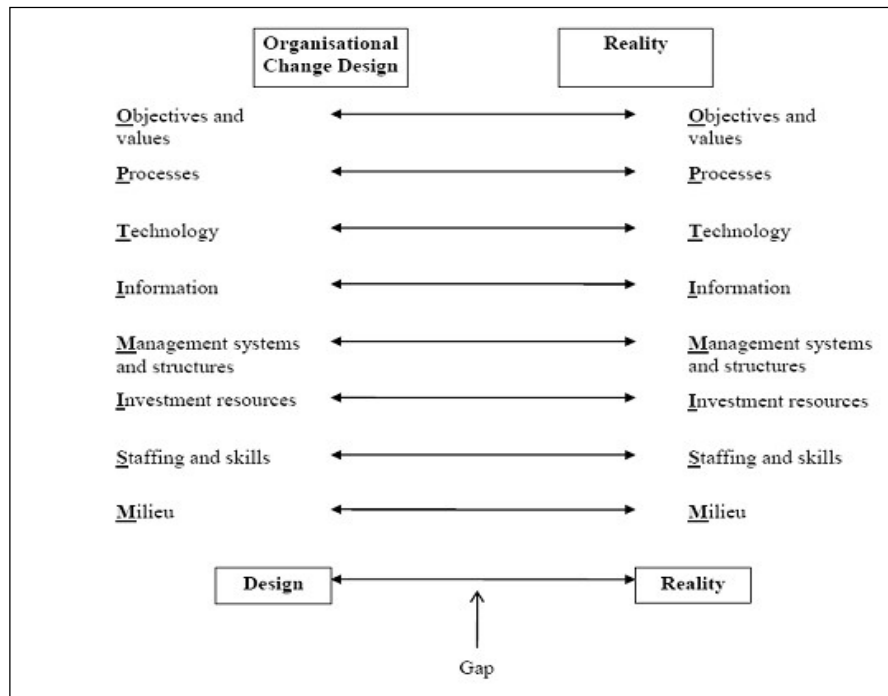


Figure 3.2: Constructs for Design-Reality Gap Model (Heeks, 2011)

Considering an operationalised Design-Reality Gap Model for this study, the OPTIMISM constructs in Bass and Heeks (2011) were found to be appropriate for the NCV IT programme evaluation. It was however kept in mind that new dimensions could emerge as a result of empirical data gathered from the studies various data sources. Table 3.3 provides an overview of the researchers interpretation of the dimensions as they relate to this study.

Table 3.3: Predefined themes based on OPTIMISM dimensions

Design-Reality Gap Model dimensions	Interpretation of the model in terms of research issues
Objectives and Values	What were the intended objectives and values of the NCV IT qualification as envisaged by government? What are the current objectives and values embedded in the programme as experienced by its stakeholders?
Processes	What processes were required to ensure effective delivery the NCV IT mandate? Are current processes effective in supporting the programmes mandate?
Technology	What infrastructure is required to support the delivery of the NCV IT programme? Is the current infrastructure adequate to support the delivery of the programme?
Information	What information flows were required to support the NCV IT programme? Are current information flows adequately supporting the programme objectives?
Management system and structures	What management systems and structures were required to support the NCV IT programme? Are the current management systems and structures adequately supporting the programme?
Investment resources	What considerable investment needed to be made to support the NCV IT programme? Is the current resource investment adequate and appropriately managed to support the programme?
Staffing and skills	What required staffing capacity, experience and skills were required by the NCV IT programme? What is the current state of staffing and skills in the NCV IT programme?
Milieu	What social, political, legal and economic requirements were needed to support the NCV IT programme? What social, political, legal and economic factors are currently impacting the programme?

3.4 Previous applications of the model

A number of evaluative studies have adopted the Design-Reality Gap Model as an evaluative tool for ICT related projects and more so as an evaluative framework for utilisation within the higher education space (Heeks, 2011). Table 3.4 summarises recent studies that have adopted the model and how it was applied.

Table 3.4: Previous applications of the Design-Reality Gap Model

Study	Summary of the Model's application
<ul style="list-style-type: none"> • Heeks (2003) • Lessa, Negash and Belachew (2012) 	Adopted the model as an evaluative tool for determining the success, failure and risk associated with e-government projects.
<ul style="list-style-type: none"> • Bass and Heeks (2011) • Dasuki, Ogedebe, Kanya, Ndume and Makinde (2015) 	Adopted the tool as tool to evaluate computing curricular within African universities to reveal progress and challenges surrounding its implementation.
<ul style="list-style-type: none"> • Kanya and Good (2013) 	Adopted the model as an evaluative tool for assessing the effectiveness of state community computer centers in Nigeria to address issues concerning national development.
<ul style="list-style-type: none"> • Blignaut, Kok and Conradie (2011) 	Adopted to determine factors contributing to the discontinuation of an internationally funded e-education initiative at a South African higher education institution.

3.5 Justification for using the Design-Reality Gap Model

The study required a framework that could evaluate the NCV IT programme mid-implementation considering its intended objectives and present state. Although the other evaluative frameworks considered were very closely aligned in terms of their constructs and focus, and could have equally been adopted, the Design-Reality Gap Model was deemed a more appropriate evaluative framework to adopt for achieving the study's objectives and answering its research questions. The choice to adopt the Design-Reality Gap Model was motivated by its inherent ability to explore a programme at both a macro and micro level which was a requirement of the study. At a macro level, it considered the effectiveness of the programme as a national ICT skills development strategy. It also allowed drilling down into the programme's internal structural and environmental elements at a micro or operational level to identify areas of progress and challenges mid implementation and identify where gaps exist. These capabilities were not as explicit in the other frameworks considered. The Design-Reality Gap Model further allowed the study to evaluate what about the programme works, for whom and in what conditions, which are in line with programme evaluation suggestions advocated by Pawson and Tilley (1997) cited in (Baraki & Kemenade, 2013).

3.6 Chapter summary

Several VET evaluation frameworks were considered for use in this study including Burnette and Clarke (1999), Fretwell (2003), Liu and Clayton (2016) and the Design-Reality Gap Model (Bass & Heeks, 2011) all of them presenting different lenses through which the researcher could approach and understand the study's research question posed. The Design-Reality Gap Model along with its OPTIMISM dimensions proved to be the most comprehensive and appropriate model to adopt in answering the research questions and was hence selected as the framework of choice.

This chapter outlines the research methodology employed in the study. Considering the research problem, it discusses the philosophical assumptions informing the choice of research design, the strategy of enquiry adopted, and the procedures for data collection, analysis and interpretation. It concludes with ethical considerations for the study and how they were dealt with.

4.1 Research methodology

4.1.1 Research paradigm and approach

A researcher's philosophical stance is reflected in the ontology and epistemology adopted during the study. Ontology represents the researcher's assumptions about how the world works, believing either that phenomena exists independently of people (objectivism), or that it is something socially constructed (subjectivism) that focuses on meaning that people attach to entities. In this study a subjective ontological stance was adopted and motivated by the nature of the research problem dealing with the evaluation of an education and training programme. Education and training has at its core the concept of a human activity system, that of learning and teaching and is representative of a socially constructed phenomena created out of interactions between people with its roots firmly established within social interaction.

Commonly adopted paradigms in Information Systems (IS) research include the positivist, interpretivist and critical paradigms (Orlikowski & Baroudi, 1991). An interpretivist approach has been adopted for this research study. Interpretive studies assume that people create and associate their own subjective and intersubjective meanings as they interact with the world around them. Interpretive researchers thus attempt to understand phenomena through accessing the meanings that participants assign to them. Klein and Meyers (1999) note that interpretive research has an ability of bringing deep insights about a phenomenon under scrutiny and it enables researchers to understand human thoughts and actions in social and organisational settings more than its counterparts. Interpretive research assumes that reality is an expression of social construction like language, consciousness, shared meanings and values, documents, tools and other artefacts (Walsham, 2006). Among the objectives of the study was to explore the shared meanings and values attributed to NCV IT as experienced by its various stakeholders, as the value derived from NCV IT means different things to different people. Adopting the interpretive paradigm was more appropriate in this context as it assisted the researcher to understand people's thoughts and actions as well as bring out various interpretations of how people view NCV IT and its role as an agent in achieving social and economic value.

4.1.2 Research Strategy

Strategies of enquiry are types of research designs or models that provide specific direction for procedures in research (Creswell, 2009). Various qualitative strategies are suggested in literature and include experiment, survey, case study, action research, grounded theory,

ethnography and archival research. This study employed a case study research strategy due to its strength in studying phenomena in its real life context using multiple data gathering methods (Benbasat, Goldstein & Mead, 1987). A single case was selected from South Africa's Western Cape Province, a TVET college at which the researcher was employed. The role of the researcher in the study was that of a practitioner researcher, described by Oates (in Dasuki et al., 2015) as somebody who is employed in an organisation and conducts research into their own work context. Similar studies that have adopted the case study approach include Baraki and Kenemede (2013) in evaluating the effectiveness of TVET in Ethiopia; Bass and Heeks (2011) in evaluating changing computing curricular in Ethiopian higher education and Dasuki et al. (2015) in evaluating changing computing curricular in African universities.

4.1.3 Target population and sample

Sampling is a technique that enables researchers to reduce the amount of data needed for collection during a study, through considering only a sub-group (sample) rather than the total number of cases (population) (Creswell, 2009). Selecting smaller cases are advocated in case study research (Saunders et al., 2009) as it allows more time to be spent collecting detailed information from those fewer cases. In this study generalisations from a selected case to a population to make statistical inferences was not sought as an objective, but rather to gain deeper insights to build understanding around the barriers that pose a challenge to the NCV IT programme's progress.

There are currently fifty registered public TVET Colleges in South Africa which operate on more than 264 campuses spread across rural and urban areas of the country. All these public TVET colleges in South Africa are under the single administration of the South African Department of Higher Education and Training, and adhere to the same governance structures and high-level policies. Acknowledgement is given to the fact that these colleges may have different internal policies which ultimately may affect the way they are managed on a day-to-day basis but essentially no reason could be found to justify why the findings of this study might not be applicable to the other TVET colleges in South Africa. The sample site selected was a public TVET College within South Africa's Western Cape Province. The study adopted a non-probabilistic sampling approach using purposive sampling based on the likelihood of participants to inform the design and reality dimensions of the study.

Guidance on which categories of participants to include in the evaluation was drawn from the VET evaluation framework by Burnett and Clarke (1999). Research participants were selected from the following categories:

- A. Current students registered in the NCV IT programme
- B. Recent graduates of the NCV IT programme
- C. Academic and Management staff involved in the NCV IT programme delivery
- D. Employers or representatives of the ICT industry

The view adopted during selection was that consensus around a domain under investigation is more likely to be found with experts rather than novices. The study therefore consulted senior members of staff with at least two years active experience and students in their final

year of study were selected due to them being able to provide a more informed perspective of the programme. Table 4.1 lists the profiles of all respondents consulted during the study.

Table 4.1: Research participant's profile

Respondent Identifier	Occupation	Description	Years in NCV IT
Manager1	Former Programme Manager	Senior Management	10
Manager2	Current Programme Manager	Senior Management	10
HOD	NCV IT Head of Department	Middle Management	9
Lecturer1	NCV IT Lecturing Staff	Software Development	7
Lecturer2	NCV IT Lecturing Staff	Hardware	7
Lecturer3	NCV IT Lecturing Staff	Systems Analysis	5
Lecturer4	NCV IT Lecturing Staff	Computer Networking	6.5
Student1	Student (entered after Grade 12)	Level 4 Student	4
Student2	Student (entered after Grade 11)	Level 4 Student	3
Graduate1	Graduate (entered after Grade 9)	Pursuing Further Studies	4
Graduate2	Graduate (entered after Grade 9)	Pursuing Further Studies	4
Graduate3	Graduate (entered after Grade 9)	Employed in non-IT job	4
Graduate4	Graduate (entered after Grade 9)	Employed in IT job	3
IndustryRep1	ICT Industry Representative	ICT Services	N/A
IndustryRep2	ICT Industry Representative	ICT Services	N/A
IndustryRep3	Student Placement Officer	Industry liaison	4

A total of sixteen participants were selected to participate in the study and fell within the minimum sample size range suggested by Guest, Bunce and Johnson (2006). Their justification of sample sizes used in qualitative research is based on the theoretical saturation point and posit that fifteen is the smallest acceptable sample size in qualitative research.

4.1.4 Time frame

The time horizon for research could be based on two perspectives, namely cross-sectional or longitudinal. In longitudinal studies the research is conducted over an extended period of time while in cross-sectional research the study is conducted over a shorter period where data is collected at one point in time (Saunders et al., 2009). In this study, the design and reality are assessed at a point in time, with the expectations within the design compared to its reality sometime after implementation.

4.2 Data collection

To construct an in-depth understanding of challenges in NCV IT, multiple data sources were consulted to obtain a multi-perspective view from various stakeholder groups. This study employed three methods for data collection: focus group discussions and semi-structured

interviews with key NCV IT stakeholders, and a documentary review of key NCV IT documentation. Data collection was conducted from November 2016 through January 2017. Focus groups and semi-structured interviews served as primary data source informing the study supported by the documentary review.

4.2.1 Focus groups and semi-structured interviews

Understanding was sought from various stakeholders directly involved in the NCV IT programme to gain a first-hand account of the current reality of the programme. It was vital that the voices and views of NCV IT stakeholders be heard which was unlikely to exist in the review of documents alone. Through focus group meetings discussion was stimulated providing an additional element of input that may not necessarily have emerged from individual interviews. These conversations helped the researcher to gain insight into experiences so that meaningful interpretations could be made.

The focus groups and interviews were conducted using a guide based on a series of open-ended questions drawn from the Design-Reality Gap's OPTIMISM model (Bass & Heeks, 2011). One focus group discussion was conducted with academic staff and management and another with graduates and current students. Three individual interviews were conducted with industry IT representatives. Focus group meetings and interviews lasted for approximately one hour each which were audio recorded and later transcribed for analysis. The interviews and focus groups were conducted face-to-face and facilitated by the researcher. To improve the level of feedback received during the focus group meetings and interviews, questions were emailed to participants ahead of the scheduled interview date to reduced the risk of participants being unprepared and unable to provide full, detailed and accurate responses.

4.2.2 Documentary review

To understand the barriers to NCV IT's success it was necessary to first understand the programme's design objectives and then contrast it with the current reality of the programme at present. Fretwell (2003) suggests that VET policy objectives and definitions are often, embodied in legislation because such definitions provide parameters for public — and at times private — financing. Creswell (2009) states that during the research process the researcher may collect qualitative documents which may take the form of official reports.

Additionally, documents provided broad coverage covering a long span of time with historic events leading to the programmes inception and provided a source of information where individuals are no longer available for consultation was evident when attempting to trace and interview individuals directly involved in the design. The documents also provided a means for tracking change and development in NCV IT over time (revisions to NCV IT policy documents). The strategy of using policy documents to inform the design / reality components of the design reality gap analysis were also adopted in similar studies (Bass & Heeks, 2011; Dasuki et al., 2013) employing the design-reality gap model for programme evaluation. Where document analysis was insufficient in comprehensively clarifying concepts, the relevant questions were posed to participants in the focus group discussions.

An initial set of documents' introductions were scanned for appropriateness and subsequently included or excluded from the documentary review. Documents reviewed were selected based on the likeliness of its content to provide insight into the design aspect of the NCV IT programme and the NCV programme's generally. Table 4.2 lists the documents considered in the document review.

Table 4.2: Documents consulted during the review

Dimension	Documents reviewed
Objectives and values	<ul style="list-style-type: none"> • Ministerial Task Team (2012) • Education White Paper IV (1998) • National Plan for FET (2008) • National Plan for Further Education and Training Colleges in South Africa (2008)
Processes	<ul style="list-style-type: none"> • NCV Policy (2006)
Technology	<ul style="list-style-type: none"> • Resource list for NCV Programmes (2016)
Information	<ul style="list-style-type: none"> • Ministerial Task Team (2012) • NCV IT curriculum • DBSA (2010)
Management systems and structure	<ul style="list-style-type: none"> • National Plan for FET (2008)
Investment resources	<ul style="list-style-type: none"> • National Plan for FET (2008)
Staffing and skills	<ul style="list-style-type: none"> • DBSA (2010)
Milieu	<ul style="list-style-type: none"> • National Plan for FET (2008)

4.2.3 Instrument design

The question set developed by Dasuki, et al. (2015) was used as the basis for compiling questions used in the focus group and interview meetings. Pre-testing the instruments involved utilising the designed instruments in a small scale study prior to the actual study. This enabled the researcher to identify problems and refine the data collection strategies advocated by (Yin, 2009). This process also assisted in the refinement of instruments so that the right questions were asked to collect relevant information that could effectively answer the research questions (Gray, 2009). The pilot study was conducted on a group of students and teaching staff that did not form part of the chosen sample for the study. A reflection on the initial interviews conducted during the pilot study was used to improve questioning in subsequent interviews. At the end of the pilot process necessary changes were made to the instruments and questioning strategy. A copy of the focus group and interview guides are attached in the appendices section.

4.3 Method of analysis

Data analysis is the process of making sense of the data collected during a study. In qualitative research analysing data to produce meaning is rigorous and follows a logical process in which certain operations are executed on the data gathered to achieve the

research objectives and answer research questions (Gray, 2009). This study followed the data analysis methods suggested by Creswell (2009) highlighted in Figures 4.1 and 4.2 below.

Different approaches to data analysis can be applied to qualitative data such as grounded theory, discourse analysis, thematic analysis, phenomenology and narrative analysis (Thomas 2003; Braun & Clarke, 2006; Myers, 2009). The choice of an analysis approach in qualitative studies is determined by the epistemological stance of the study and the theory being applied. In this study, the analysis followed a deductive approach guided by the OPTIMISM dimensions of the Design-Reality Gap Model while applying thematic analysis

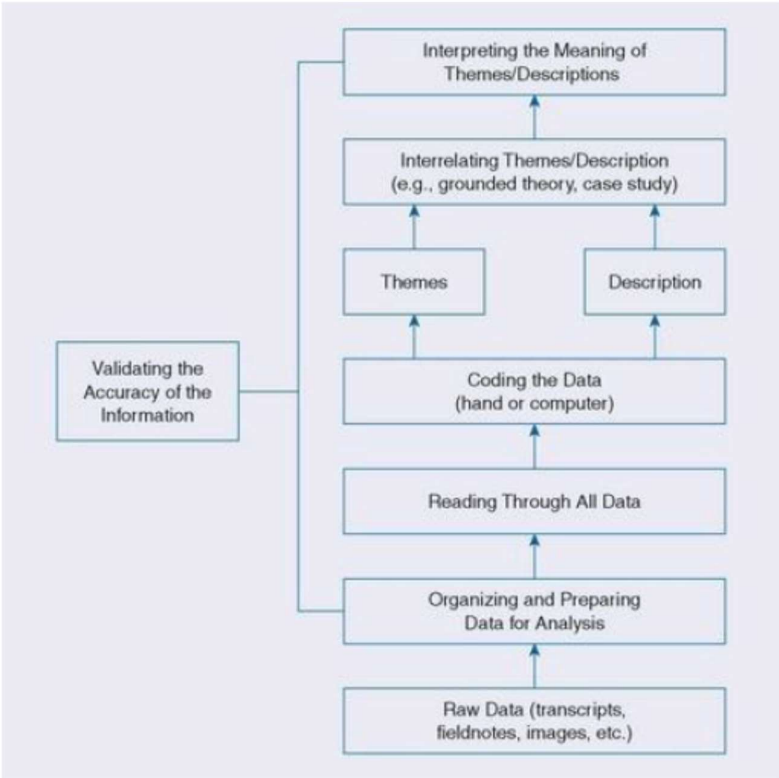


Figure 4.1: Steps in qualitative data analysis (Creswell, 2009)

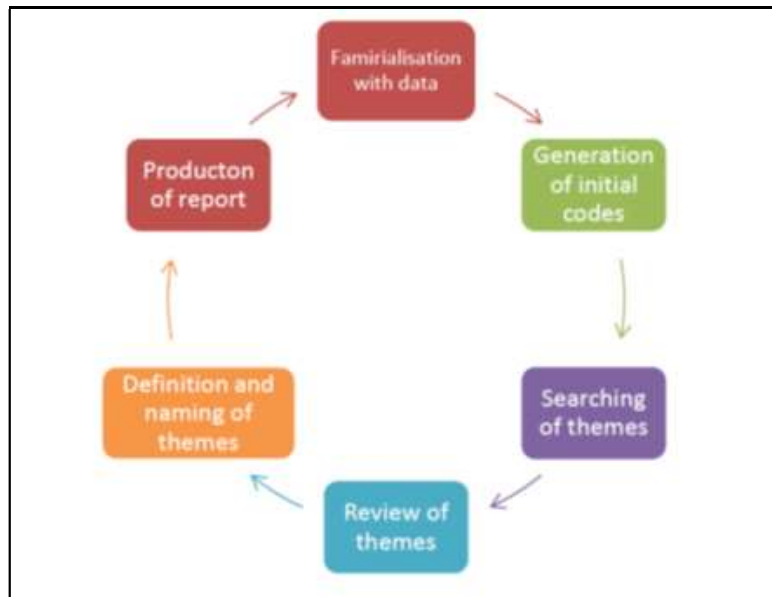


Figure 4.2: Six steps of thematic analysis (adapted from (Braun & Clarke (2006))

As with any software program, qualitative software programs require time and skill to learn and employ effectively. The researcher therefore opted to employ a manual coding process and utilised predefined themes based on the OPTIMISM dimensions for the initial categorisation, while paying attention to any new emergent themes that could have arisen from the data analysis. A codebook was generated and a narrative passage utilised to convey the findings of the analysis. The data analysis process started with analysis of secondary data (documentary review) to establish the design intentions of the NCV in South Africa. The focus was on the underlying premise for its inception as a skills development initiative and its promise on how it will address the issues of a skills shortage and unemployment. The next step in the data analysis involved analysing focus group and interview data to establish the implementation realities of NCV IT at present. The third step in the data analysis was to compare the findings around the design and reality to establish where design-reality gap exists. The fourth step was looking to these gaps further and establish what implications it had on the overall mandate of the NCV IT strategy. The final step was to make recommendations on how these gaps could be narrowed and developing action items based on moving the reality or the design aspect accordingly.

4.4 Research validity and reliability

The main limitation of the the study was its single case study approach. The chosen approach is largely criticised by positivist researchers in their claims that a single case study is not generalisable (Walsham, 2006; Yin, 2003). In this study, generalisation from the setting to a population was not sought; rather, the intent was to understand the deeper structure of a phenomenon. The study ensured validity of the findings through the triangulation of the study's various data sources. The design aspect of the study was informed through a documentary review of a host documents around the programme's design which were corroborated with feedback from respondents. The reality aspect of the study was informed through focus group sessions and semi-structured interviews conducted

with a various categories of participants. This provided multiple perspectives on the phenomena being evaluated from all stakeholders involved and a richer picture of the study. This further reduced the likelihood of any bias that could have resulted from the researchers practitioner researcher role in the study. To ensure construct validity the instrument of Dasuki et al. (2015) was modified to fit the context of the proposed study. In follow up discussions with participants, member checking was employed wherein the researcher discussed summaries of the findings with participants to determine the accuracy of the findings recorded. Another limitation of the study was the scoring methodology employed to rate the reported dimensions. Scores assigned were decided by the researcher based on the discussion feedback received from participants, and were meant to closely reflect what has been discussed in the focus group sessions. Ideally these scores could have been collected from individual participants instead with aggregated scores reported.

4.5 Research ethics

Research ethics is the application of moral principles in planning, conducting and reporting results of a study (Myers, 2009). Ethical considerations present a moral stance for the researcher to achieve high level of competence and also consideration of the respondents. In this study permission to conduct the study was obtained from the college Principal and Programme Manager for the IT Department at the college in question. This is in line with official DHET policy which stipulates that permission for conducting research be requested from the respective college Principal. The aim of the study was communicated to all participants beforehand and agreement to participate was authorised through signing individual consent forms attached in the appendices section. Candidates participating in the study were older than 18 and thus no parental consent was required. All participants identities were omitted in the study. Participation was voluntary and the respondents were informed of the purpose of the study and the use of the data being collected to ensure their privacy and confidentiality. The researcher followed the code of conduct set by the University of Cape Town Ethics Committee.

4.6 Chapter summary

The study followed an interpretivist approach, using a single case study method. Qualitative data was gathered and analysed deductively using the Design-Reality Gap Model as a frame. Semi-structured interviews, focus group meetings and documentary review were adopted as the methods for data collection. A total of sixteen participants from various interest groups were consulted during the study, ensuring provision of deep insights from as wide a perspective as possible.

This chapter presents a systematic analysis of the data collected, and summarises key findings to address the study's research objectives and research questions. It also discusses implications of the findings in relation to the literature reviewed.

5.1 Introduction to research findings

Qualitative data was collected from semi-structured interviews, focus group discussions and the review of key documents describing NCV IT's intended design and current realities. Consulting various data sources allowed the findings to be corroborated across data sets to reduce the potential of bias resulting from consulting any single source. It further provided supplementary data that would otherwise be lacking when consulting a single source. Data collected to inform the design aspect of the study aided in focusing and formulating questions posed to participants during the investigation of the study's reality aspect. The study assumed there are gaps between the government's intended design of the NCV IT programme, and current realities of the programme as experienced by stakeholders, hence the applicability of the Design-Reality Gap Model (Heeks, 2002). Design-Reality gaps identified were reported according to the model's eight OPTIMISM dimensions.

5.1.1 Design aspect

The first objective of the study was to identify the assumptions made by the designers about the NCV IT programme. This process started off very broadly, and involved consultation of a host of documents outlining South Africa's revitalised VET strategy for the TVET sector. The documentary review process later became more refined to focus on NCV's IT specialisation. Several documents were skimmed for content relating to the eight OPTIMISM dimensions – Objectives and Values, Processes, Technology, Investment and Resources, Management Structures, Information, Staffing and skills, Milieu. Although documented evidence for NCV's design in general was available, details explicitly relating to the IT programme could not be identified during the document search. To gain the required insight into NCV IT's design, a semi-structured interview was conducted with a former programme manager of the NCV IT programme who had direct involvement in the initial design phase.

5.1.2 Reality aspect

The second objective of the study was to understand the reality of the programme at present. This was achieved through an analysis of the feedback of two focus groups discussions - one with academic staff and management directly involved in the programme's execution and another with a group of current students and recent graduates of the programme. Three semi-structured interviews were also conducted with ICT industry representatives. Thus ensuring a multi-perspective view of the programme's reality from its various stakeholder groups. Key stakeholder groups that informed the study are illustrated in Figures 5.1 and 5.2.

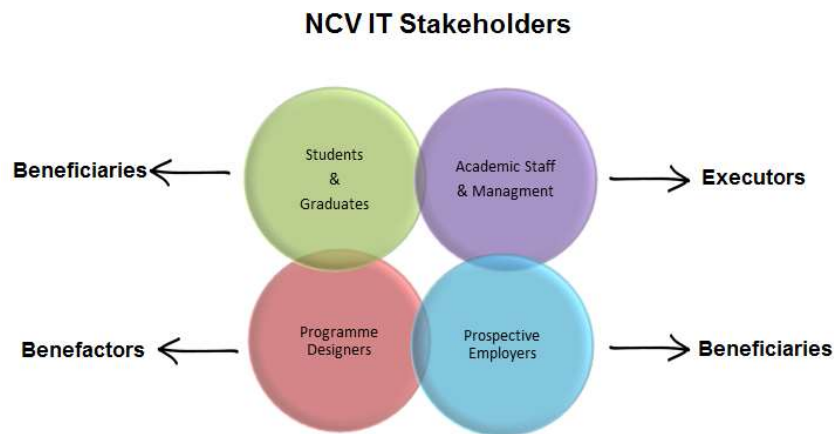


Figure 5.1: NCV IT stakeholder groups

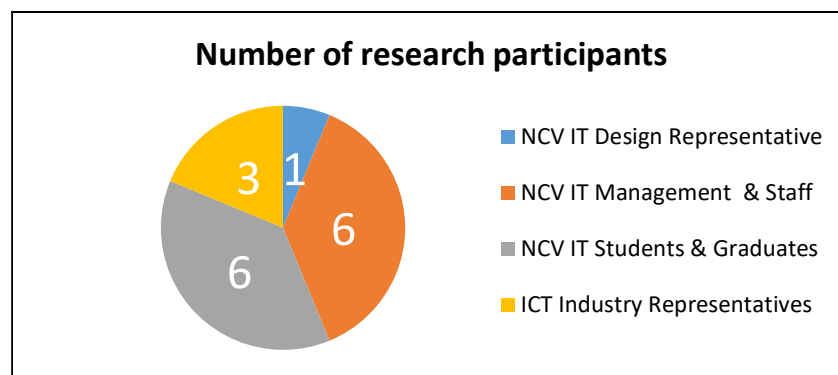


Figure 5.2: Number of research Participants

5.1.3 Design-Reality gaps

The third objective of the study was to compare the findings from the programme's design and reality to identify design-reality gaps indicative of the programme's challenges at present. The interpretation of design-reality gaps were quantified on a scale from zero to ten depending on the size of the gap between the dimensions design and reality. The zero scale indicated little-to-no difference between design and current reality, ten represented a complete difference between the design and current reality, and 5 indicated some degree of difference between design and reality (Lessa et al, 2012). Detailed findings for each of the OPTIMISM dimensions evaluated are presented as narratives accompanied by an overall gap score for the dimension.

5.2 Objectives and Values gaps

The objectives and values of VET in South Africa is probably the most important contribution to the discussion of the findings, given that it constitutes the bedrock upon which all further discussions are based. Vocational education occurs in many settings that vary between countries and as an initial step in the evaluation, it was necessary to understand what objectives and values were embedded in South Africa's VET context. This dimension

discusses the macro-level objectives of the country's NCV strategy before delving into the operational details of its IT specialisation in subsequent dimensions.

Design expectations

In South Africa vocational education is delivered by public TVET Colleges through a host of NCV qualifications. NCV as an educational policy, refers to vocational training, whose aims are connected to the demand for specialties formed by priority sectors of the country's economy. At the time of NCV's design the programme was aligned with eleven priority sectors including ICT (Papier, 2009). The NCV aims to increase the rate at which key skills necessary for economic growth and social development are delivered, and to serve the growing number of young people and adults seeking education and training (DHET, 2017). According to SAQA, the objective of the NCV qualification is to prepare learners for higher level studies or employment in one of the priority sectors:

"..aimed at learners in FET colleges. These learners leave the FET College either for higher education or for employment in the workplace...aims to equip learners adequately for entry into the world of work by providing them with practical skills related to a particular socioeconomic or vocational sector."
(*"Ministerial Task Team," 2012, p.5*)

The framework for NCV is outlined in the Education White Paper IV (1998) and the National Plan for Further Education and Training Colleges in South Africa (2008) and clarifies its objectives and values. These have been grouped by the researcher into two broad categories, political objectives and socio-economic objectives:

Political objectives – After the newly elected government's transition to power in 1994, radical change was required to remedy the ills of apartheid. Among these changes included the need to overhaul the ineffective FET sector and to create institutions that were accessible to all, more coherent, and more responsive to the current needs of the country and its citizenry.

"FET provision today is characterised by fragmentation, poor co-ordination, inefficiency and inequality. In fact, it is difficult, in the present context, to talk at all of an FET system." (White Paper IV, 1998, p.20)

The FET college sector prior to its overhaul was beset by a variety of challenges from which it had to emerge if it was to play a meaningful role in serving the country's needs. These challenges included:

*"Poor co-ordination of the FET College sector
Poor public perception and lack of sector identity
Poor student access and low student participation rates in vocational programmes
Poor quality programmes and qualifications
Low graduation and throughput rates arising out of high failure rates and low retention rates
Low technical and cognitive skills of graduates*

Lack of relevance and responsiveness to the needs of the economy
Dearth of managerial skills and capacity
Low funding of the FET college sector
Absence of an effective management information system to inform decision-making
Lack of understanding of vocational education
Shortage of suitably qualified lecturers to drive vocational education”

(National Plan for FET, 2008, p.14)

This led to the recapitalisation of the FET sector and the merger of the country's 152 technical colleges into 50 mega colleges. The revitalised FET sector was rebranded as the TVET sector but required a new qualification that could meet out its new vision, as a result the NCV qualification was conceptualised, and officially rolled out in 2007.

“in the absence of a substantive qualification in colleges, finding the context for recapitalization was problematic. Thus, the conceptualization of a new qualification was born out of the need for purpose-driven and targeted development and resourcing of the FET Colleges.” (“Ministerial Task Team,” 2012, p.3)

Socio-economic objectives – Economic reform demanded the address of current skills shortages required to boost South Africa's economy, to be a more productive economy and and to compete in the global digital economy. The economic objectives of NCV are clarified in the report by the ministerial appointed task team for NCV:

“Institutionally, the purpose behind the introduction of the NC(V) was limited to provide a sophisticated and contemporary vocational set of qualifications that would draw a new cohort of learners to colleges, which, in turn, would address the skills shortages already pressing hard on the South African economy.” (“Ministerial Task Team,” 2012, p.7)

Social reformation post-apartheid meant a greater focus was needed on poverty alleviation and tackling high unemployment rates specifically among the youth. A key goal for training the unemployed, from a public policy point of view was to reduce poverty and provide an opportunity for its citizenry to be self-sufficient (NDP, 2012). These sentiments were further echoed by the former programme manger for NCV IT stating:

“NCV was government's way of getting rid of the old apartheid technical colleges, and they formed these mega colleges. NCV, if it worked, would solve their [South African government's] mass unemployment with the youth” (Manager1)

Current reality

Political realities - Although the TVET sector has achieved strides in revamping its identity, the challenges from its previous FET regime remain ever present and is elaborated in discussions of subsequent dimensions. The improvement of access to vocational education

in general year-on-year highlighted in Table 5.1 is evident, but at the cost of attracting a cohort of learners who do not meet the intended design expectations initially set out by the programme. NCV IT lecturers are of the opinion that the programme is attracting the wrong calibre of learner and for the wrong reasons.

“If you fail everywhere else you just come to NCV IT to try your luck somewhere else” “The main reason why it’s [NCV IT] is failing dismally is because it has become a dumping ground for those that have been rejected my mainstream education. As a result of this you get the weaker student going for NCV, and that is where the whole thing is flopping” (Lecturer4).

“Parents from low income households only use this opportunity [NCVIT] because of the elaborate bursary scheme offered to learners” (Lecturer1)

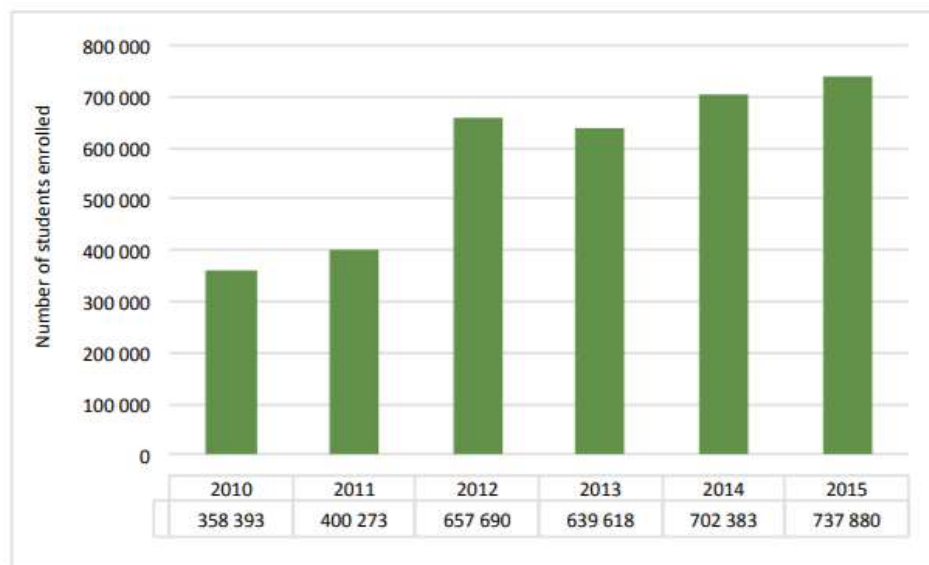


Figure 5.3: Number of students enrolled in TVET colleges 2010 to 2015 (DHET Statistics, 2015)

Socio-economic realities - The inclusion of an ICT specialisation among the government’s NCV offerings bare testimony to the growing need for ICT skills in South Africa, and confirms the country’s reported ICT skills shortages (Plaatjies & Mitrovic, 2014; Calitz, 2010; JCSE, 2016; MICT, 2013). Minimal absorption of NCV IT graduates into ICT posts within industry however remain a challenge. Graduates highlighted their difficulty in securing meaningful employment post graduation and was concurred by the college’s student placement officer stating employers lack confidence in the NCV IT qualification, as a result they are reluctant to employ NCV IT graduates.

“Honeslty speaking you cant get a job with only NCV[IT]. You have to go and study further.”(Graduate2)

“Our NCV IT background helped us when pursuing further IT studies but wasn’t enough to get us employed on its own, the people that interviewed us didn’t even know about NCV” (Graduate1)

“I really struggle to get the NCV IT students placed at companies. And its because employers don’t know what NCV is and the skills that our students come with just don’t match what companies are asking for. Most Of our graudtaes are working in retail jobs or unemployed.” (IndustryRep3)

When questioning student and graduate respondents about their objectives for pursuing the NCV IT qualification. A persistent response from the group indicated that at the time of registration they were hopeful that the NCV IT qualification would create employment opportunities upon graduation as the ICT field provided great employment prospects.

“Nowadays everthing is about IT. Every company needs to employ IT professionals so there is always work for people with IT skills” (Graduate2, Graduate3)

“My initial objective was to study NCV IT then find work, but then I couldn’t find any work and had to go study further. NCV is good if you plan to study further not if you want to go work afterwards” (Graduate1)

It was evident that although NCV IT was to provide a dual path transition to higher education or entry-level employment, few registrants start off hoping to use the qualification as a springboard to tertiary education but rather realise during the course that contra to the aim of the qualification it did not sufficiently prepare them to enter employment. This is particularly serious in the light of learner expectations, especially around employability.

Other students noted that it was a last resort after failing to secure acceptance to universities due to academic underachievement or for financial reasons. While it provided a second attempt for a large majority to attain success after failing to perform in mainstream schooling.

“Pricey university courses are out of reach for many, and TVET colleges are usually more affordable because government subsidises 80 percent of the programme costs” (Student2)

“I failed Grade 9 twice then decided to enter NCV IT.” (Student1)

“I was tired of school, doing the same thing over and over and I didn’t enjoy school. The school I went to was more of a prison, and then I saw I could rather go and study IT at college and get out of school. (Graduate4)

Design-Reality gap and implications

A key finding identified was that rather than attracting academically performing mainstream scholars hoping to specialise sooner, the programme seems to be attracting learners for a host of reasons that appear out of line with NCV’s initial design. The South African government’s objectives for the NCV IT programme were to address the country’s ICT skills shortage, bolster employment opportunities and improve access to education for the previously disadvantaged through a new high quality programme offering by its revitalised TVET colleges. While the NCV qualifications are vehemently promoted as a skills enabler

and agent for addressing the unemployment crisis, feedback from NCV IT graduates indicate otherwise. An analysis of the data collected revealed NCV IT graduates battle to find meaningful employment, with many graduates working in jobs outside of their field of specialisation or forced to pursue further studies to better align their skill set with what employers are demanding.

The purpose of the NCV IT programme and the extent to which it meeting its objectives are thus questionable. In particular, there appears to be uncertainty about whether NCV IT is preparing learners to enter particular IT occupations and if so, which ones, or whether NCV IT is primarily a foundational bridging programme that prepares learners to access higher learning IT programmes. The opportunities that NCV IT learners are able to achieve upon completion of the programme appear inconsistent with the original intention of the qualification. It was further noted that government's emphasis on the political value derived from NCV has come at the expense of its intended social and economic benefits. A clear shift has occurred in what government hoped to achieve with NCV IT initially and its value to government at present. Government's focus has been primarily on access to education and training and promoting NCV IT as a springboard to higher-level learning rather than as an enabler for employment in the ICT field and addressing the country's ICT skills demands.

NCV IT lecturers describe the programme as a post-apartheid dumping ground for the financially disadvantaged and academic underperformers that are neither employed or enrolled in other education and training. The ICT skills gap continues to widen as poor supply cannot meet the growing demand for ICT skills. The unemployment rate among the trained now increases. Failure to absorb NCV IT graduates means an ineffective NCV IT strategy with the legacy of a ineffective TVET sector in South Africa continuing. Without the requisite ICT skills demands being met greater focus will be turned to sourcing skills from outside of the country to sustain its industries.

Gap = 8; only selected design expectations are met in reality.

5.3 Process gaps

The process dimension discusses end to end processes required to supply appropriately skilled workforce to meet South Africa's ICT market skills demands. These include – admissions, progression and throughput, and graduate absorption by the market. The teaching and learning process is discussed in the information dimension and staffing and skills dimensions.

Design expectations

For school-going youth NCV was to create a viable alternative to the more academic-focused matriculation qualification catering for learners with a more practical bent interest in a vocational field. For workers it was meant to result in formalised recognition for skills, whereas for the employer it was to address the skills demand and hence increased productivity. Admissions to the NCV IT programme are open to pre Grade 12 learners that have at minimum completed Grade 9, post Grade twelve learners and also pre-employed, unemployed and employed individuals. The NCV Policy (2006) in its description on entrance

requirements is silent on the issue of age requirements, however the assumed minimum age for entry is 16 years, which is commensurate with a learner who has completed Grade 9. No indications of an upper age limit have been identified from the literature sources consulted. In addition to the minimum Grade 9 requirement for entrance into the programme, colleges insist that a pre-enrollment career guidance test (PACE test) be completed by potential registrants. The PACE tests measures numeracy and literacy skills, with output suggesting appropriate career paths for registrants to pursue. Certification requirements for each of the NCV levels as stipulated by national policy initially dedicated that students obtain:

- a) At least 40% in the required official language
- b) At least 30% in mathematics or mathematical literacy
- c) At least 40% in life orientation
- d) At least 70% in each of the four vocational subjects

The requirement for the vocational subjects was later amended to a minimum requirement of at least 50%.

Current reality

5.3.1 Admissions

The NCV programmes in general have a requirement of a completed Grade 9 for entry into any of the broad spectrum of its specialist courses. A key concern impacting on the learning and teaching process in the ICT programme specifically is the lack of formalised ICT-specific admission criteria in the first place.

“We just allow anyone in, as long as they have a minimum of Grade 9 we cannot turn them away, even if they are not analytically minded which is required in the IT course” (Lecturer3)

Lecturers additionally noted difficulties in dealing with the mismatch between the demands of the curriculum and the inability of many of learners to cope. This has largely been attributed to the absence of an ICT specific entrance assessment done on potential registrants to measure their readiness and aptitude to deal with the demands of an ICT curriculum. Learners wanting to pursue an engineering-based qualification have the same requirements as learners wanting to pursue a business qualification. It was further noted that many of the students lack readiness at entry due to schools encouraging poor performing learners to leave, with many of learners entering the NCV IT programme without the requisite foundational knowledge.

“Admissions has huge implications for teaching and assessment; the weak learners don’t know what is going on, while the strong ones become bored. The system just allows everyone in irrespective of their abilities “ (Lecturer1)

“Schools see the NCV IT programme as an opportunity to divert their ill-disciplined and weak learners to colleges” (Lecturer3)

“We have to chase numbers, to put bums on seats. Entrants are mostly just placed in the course without any proper selection or pre-testing to meet projected numbers of learners.” (Lecturer4)

“These students don’t even know anything about IT or what it is all about, they get rejected from the other programmes and because here is space in IT and a bursary know they go for it and struggle to get through the course.” (HOD)

Even though the mixed-age classroom scenario is not unique to the NCV IT programme, what is unique to the programme is that learners entering NCV IT, enter from varying points. Some learners enter after completing Grade 9, while others enter with Grade 12, while some last attended any form of school ten years ago. The result thereof is that lecturers end up with mixed classes of varying ability, maturity levels and school leaving backgrounds. Additionally the ages of these learners are between 16 and up (with no upper limit) and often sees a mix where sixteen year old learner and thirty-five year old learner are learning side by side. The negative impact of this very broad admissions policy is evident in the classroom setting and further evident in the low throughput rates for the programme.

5.3.2 Progression and Throughput

Progress and concession policies on carrying over failed subjects into the following year increases the load on already struggling learners and cuts into the time they have for study, further hindering student progress. Lecturers also felt this had an impact on their teaching and assessments:

“We have to deal with learners at Level 3 who have not covered the work for Level 2. These repeaters just take up extra time of ours that we don’t even get paid extra for.” (Lecturer3)

A comparison between NCV IT supply (NCV IT throughput) and demand-side statistics contribute to the inadequate supply of ICT skills to industry. A DHET (2015) statistics report highlights the low throughput rates in Table 5.3. These low throughput rates are indicative of substantial inefficiencies within and poor quality of delivery in the NCV IT programme and discussed in subsequent sections. While the literature reports ICT skills demands to be in the region of 70000, NCV IT supply indicated average throughput rates in minimal period to be around 0.3%. The average NCV subject pass rate for 2009 was 59,7% and is indicative of the systemic inefficiencies within the programme manifesting itself in low pass, success and throughput rates. The impacts thereof are an insufficient supply of skilled ICT workforce to the labour market and a substantial unwarranted financial burden on the country’s fiscus. DHET believes the throughput rate must increase to 80% if the system is to make an impact in the short to medium term on skills needs, particularly in the area of youth between the ages of 18 and 24 years.

NC(V) Certification Rates by programme											
	Certification rates			Dropout rates			Throughput rates (within minimum time)				
NC(V) Programmes	L2	L3	L4	L2	L3	L4	L2	L3	L4	L2-L4	
Civil Engineering & Building Contr.	23%	20%	26%	31%	14%	13%	16%	17%	23%	0.6%	
Education and Development	44%	60%	61%	28%	12%	10%	32%	53%	55%	9.3%	
Electrical Infrastructure Constr.	23%	26%	29%	29%	10%	9%	16%	23%	26%	1.0%	
Engineering and Related Designs	25%	19%	23%	29%	16%	11%	17%	16%	21%	0.6%	
Finance, Economics & Accounting	30%	30%	28%	30%	12%	7%	21%	26%	26%	1.4%	
Hospitality	40%	41%	37%	24%	15%	10%	30%	35%	33%	3.4%	
IT and Computer Science	18%	15%	21%	32%	13%	11%	12%	13%	18%	0.3%	
Management	33%	30%	44%	31%	13%	10%	23%	26%	40%	2.4%	
Marketing	35%	41%	39%	30%	15%	11%	24%	35%	34%	2.9%	
Mechatronics	29%	22%	29%	19%	6%	2%	23%	21%	29%	1.4%	
Office Administration	43%	33%	47%	24%	13%	10%	33%	29%	42%	3.9%	
Primary Agriculture	26%	35%	28%	22%	10%	9%	20%	32%	26%	1.7%	
Primary Health	61%	N/A	N/A	29%	N/A	N/A	43%	N/A	N/A	N/A	
Process Plant Operations	40%	40%	45%	26%	18%	8%	30%	32%	42%	4.0%	
Safety in Society	47%	43%	49%	29%	20%	14%	34%	35%	42%	4.9%	
Tourism	41%	42%	63%	31%	14%	9%	29%	36%	57%	5.9%	
Transport and Logistics	42%	61%	N/A	29%	16%	N/A	30%	51%	N/A	N/A	
Total	33%	30%	37%	28%	13%	10%	23%	26%	33%	2.0%	

Source: DHET (2013) Examinations data (as in DNA Economics (2015) *Performance and Expenditure Review: Technical and Vocational Education and Training*. National Treasury)

Figure 5.4: NCV IT throughput rates 2015

Design-Reality gap and implications

A key objective of the NCV IT programme was to address the ICT skills crisis in South Africa through upskilling youth with a more practical inclination to specialise earlier. Findings reveal a general increase in the amount of students accessing vocational IT studies at TVET colleges, however throughput rates remain at a minimum and unable to address supply-side ICT skills demands. Among the contributing factors suggested by respondents are ineffective selection criteria at admission. Progression criteria was argued to be another factor, allowing students to carry several repeat subjects across the three levels contributing to the strain experienced by the already demanding curriculum requirements. The result of this ineffective selection process sees learners not being matched correctly to their fields of interest which negatively impacts on the motivation of the student during the course of study, their ability to meet the academic demands of the programme and ultimately affects throughput rates of the programme. A third factor was the mixed classroom scenario which further impact the learning and teaching process and ultimately programme throughput rates.

Gap = 9; design expectations are hardly met in reality.

5.4 Technology gaps

This dimension evaluated technological infrastructure requirements necessary to support the effective delivery of the NCV IT programme and the adequacy of the infrastructure at present.

Design expectations

The Resource list for NCV programmes (2016) lists at a high level the requirements for the NCV IT programme. Among these include:

- Computer labs with an internet connection and printing facilities.
- PC's in computer labs to be pre-loaded with the required application software
- Technical equipment requirements for practical demonstrations and classwork

It was noted that a first formal version of a resource list was drafted in 2016, nine years post the rollout of the NCV programme which is itself a problem.

Current reality

In discussion with students and lecturers around their experiences relating to the adequacy of current technological infrastructure to support the learning and teaching process, the following sentiments were echoed:

"Internet access is a huge problem at the college and also the network is really bad. Students are also capped by the administrators and this prevents us from completing our work." (Student1)

"There are no labs available for use to use and do work after hours, labs are used for teaching during the day then it gets locked at 15:30" (Student2)

"We have the necessary infrastructure in place but its just not being managed well enough by our IT administrators. This does impact on our ability to deliver our lessons and we often experience network issues [slow network / computer freezes] during our exams" (Lecturer1)

Although the sample site scored particularly well in this dimension, it was noted by a management respondent that many other colleges in the country do not enjoy similar benefits in terms of its infrastructure:

"Our infrastructure is problematic, but you need to see the state of other colleges their situation is way worse than ours" (Manager2)

Design-Reality gap and implications

Even though technical infrastructure is in place its management appears to be ineffective. Concerns raised were around the effectiveness of existing infrastructure as it did not adequately support the teaching and learning process as required. Major concerns raised were around internet access restrictions, the speed of internet connections and the availability of computer labs that could be utilised by students outside of the dedicated classroom time as many of students do not have a computer or internet connectivity at their homes.

Gap = 5; design expectations are partially met.

5.5 Information gaps

Considering the information dimension for the NCV IT programme we interpret information in two ways. Firstly, internal information relating to the curriculum of the NCV IT programme. Second, external information flows represented by linkages between the NCV IT programme and its external stakeholders.

Design expectations

The NCV IT curriculum was architected by the Department of Education in 2005/6 and was subsequently approved by the Minister of Education, and later registered with the South African Qualifications Authority (SAQA). The registration of the curriculum with SAQA proceeded despite it being unfavourably received during design time by the very industry whose skills demands it was meant to address. This testifies to the IT industries lack of confidence in the NCV IT qualification prior to the programme's roll out.

“The circulation process for the NC(V) was managed as a special project in the Department of Education, drawing mainly on college lecturers and augmented by experts in the respective vocational and occupational fields. Although efforts were rendered to engage a wide spectrum of stakeholders, particularly from industry, the design and duration of the qualification found little favour among employers, resulting in poor participation in the development process. Nonetheless, the Department undertook extensive referencing of the draft curricula, which disappointingly yielded limited concrete input” (“Ministerial Task Team,” 2012. p.4)

It was this very curriculum that was envisaged to equip graduating students with the necessary competency to pursue further studies or enter into entry level positions in industry and address the current ICT skills shortage.

Current reality

5.5.1 Information about the Curriculum

All stakeholder groups consulted in the study raised concerns about the curriculum of the programme not being optimally aligned to the skills demands of employers. The common response from ICT industry representatives were that NCV IT graduates have a general grounding in the ICT discipline which needs to be further developed in the workplace to develop the necessary occupational or trade skills required by the job.

“The NCV IT graduates that we place at our company have the foundational ICT skills but that is not enough, we have to put them through training programme where they get an initial induction into what is required, then learn on the job” (IndustryRep1)

“They [NCV IT graduates] have the basics for entry-level techie [IT technician] posts, but we obviously can't place them in more senior posts” (IndustryRep2)

“Most of the companies that I meet don't really know about the qualification and are reluctant to take on our grads.” (IndustryRep3)

These sentiments were echoed by students who felt that the lack of employment opportunities was a direct result of their misaligned skillset in comparison with industry demands:

“The curriculum [of NCV IT] doesn't correlate to industry. If you take VB [visual basic] for example...who uses that in industry? If you want to be a PC technician yes, but if you want to go into programming or networking then you have to study further.” (Graduate1)

“They could have added java and c# to the curriculum to make it more relevant, because that is what the companies are asking for” (Graduate2)

“I found my other courses after NCV IT to be more relevant and aligned to industry needs” (Graduate1)

“The NCV IT curriculum has to change because IT is constantly changing and get industry to come in and provide input into what they looking for and change the curriculum.” (Lecturer3)

“Certain parts of the curriculum like the hardware and networking subjects are ok but the programming component needs to be updated to be more relevant to industry. It would be great if they could also complete some [International vendor-based] certifications during their study, those guys are more employable.” (IndustryRep3)

To gain meaningful employment in the ICT sector students NCV IT graduates possessing vendor certifications coupled with some degree of industry experience proved to be more employable. Students remain largely unemployed or find themselves working outside their field of specialisation. This being largely due to employers requiring a skillset that has not been the core of training received by NCV IT graduates. Students that successfully complete the programme are faced with lack of opportunities to pursue post-graduation due to a lack of recognition of the qualification by the ICT industry. The root cause hereof is both the quality of provision of education at TVET institutions exacerbated by the technological advancements and rapidly evolving digital economies.

An analysis of documentary evidence (“Ministerial Task Team,” 2012; DBSA, 2010) suggests that the department of education did not consult sufficiently with industry when designing the curriculum and that its implementation appears to have been rushed in the first place and undeveloped in subsequent years of the programme. In addition to problems relating to the curriculum content, the training of lecturers in the delivery of this curriculum was poorly executed as stated by one lecturer respondent:

“The NCV IT curriculum developed by TUT [Tswane University of Technology] with initial training provided to academic staff mandated to teach in these programmes, but was ineffective as rather than training lecturers in their specific subject disciplines, the NCV IT curriculum training provided was very generic” (Lecturer2).

“It is one thing to say colleges must keep up with the times and change their curriculum, but does that mean the curriculum must change very year to keep abreast with indust, that’s impossible” (Lecturer3)

A detailed course curriculum for NCV IT is illustrated in Figure 5.3. A compasrison between the curriculum and skills demands of industry from the literature reviewed confirms the disparity.

8. Information Technology & Computer Science	Electronics	Computer Hardware and Software	Data Communication and Networking
	Introduction to Information Systems Introduction to Systems Development Contact Centre Operations(O)* OR	Systems Analysis and Design Principles of Computer Programming Contact Centre Operations(O)* OR	Systems Analysis and Design Computer Programming Contact Centre Operations(O)* OR

Figure 5.5: NCV IT curriculum

The new curriculum was been developed in response to new challenges in the local and global economic and social environment, but has not kept abreast with the rapid pace of technological advancement as is evident from the skills requirements reported by the literature.

5.5.2 Information Flows with External Stakeholders

Closely aligned to the issue of the curriculum, is the question of career guidance to learners. Many students often pursue the qualification without a proper understanding of what it entails and the programme outcomes after the three year period. These notions were highlighted in the misiterial task team report for NCV and in feedback from lecturers:

“A major shortcoming in the colleges is that absence of sound career guidance to the learners regarding subject combinations as well as employment opportunities.” (“Ministerial Task Team,” 2012, p.19).

“80% of the class failed because they never really wanted to do IT, they just enrolled because they wanted an opportunity to study. And people don’t really know what IT is, it’s a big field, and when they come here they see this is not for them.” (Lecturer4)

On the question whether they felt sufficient career guidance was provided at enrolment, a student responded:

“no. They told us it was a really good course. But they never told you it was just a basis. I thought it will give me sufficint knowledge to go work. (Student2)

Feedback from a management respondent highlighted the the need for attracting students to the programme to meet the projected enrolment figures. This often means enrolling students who would be better suited in other areas of study or even at a university of technology.

“we are forced to enroll students to achive our numbers, otherwise we would have to cut jobs” (Manager2)

Feedabck from graduates and industry representatives indicate a considerable dissatisfaction by employers with the general level of preparedness of prospective entry-level employees. While most employers expect to train new employees in company-specific procedures and to acquaint them with the behavioural norms, standards, and expectations in their company as well as job-specific technical skills required. They are very clear that the training insitutions should take most of the responsibility for equipping young people with general employability skills:

“Colleges and universities need to find out what are the latest tehchnologies used in the market and what skills are required and tailor their programmes accordingly” (IndustryRep1)

Design-Reality gap and implications

The information dimension reflects a relatively large design-reality gap. The findings show that the NCV IT programme underwent a hasty implementation at a time when South African colleges were in an intense state of flux with mounting pressure from government to enact change to build a new South Africa. The focus henceforth was on improving access and the amount of students entering the system rather than on ensuring the relevance of skills and employment opportunities for those exiting the system. Major shortcomings were noted in the programme’s curriculum which has gone unchanged since its inception in 2006. Structural adjustments of NCV it curriculum are urgently required as is inevitable with any new curriculum after a testing period of its delivery. The unemployment crisis and inability for NCV IT graduates to find meaning employment is partly because employers can’t find suitable candidates with the right technical skills. An expectation from industry however is that institutions produce graduates that are better aligned with industry requirements and readily useable to derive profit. Additionally, insititutions are not able to cope with the rapid advancements in technology and the vast skills demands of the ICT industry.

Gap = 9; core design expectations are not met in reality.

5.6 Management systems and structural gaps

Not all aspects of NCV IT challenges can be attributed to policy actions. Contributing factors in NCV literatire found to be plaguing the programme include ineffective management structures, exacerbated by issues of staffing and skills (National Plan for FET, 1998). This dimension looks at the management systems and structures both in the Department of Education and at TVET colleges required to support NCV IT and its reality at present.

Design expectations

The FET Amendment Act of 2009 gave birth to the function-shift process as a legislative requirement and also to guide function-shift transfer of TVET functions from the Basic Education Department to DHET. The functions in relation to Further Education and Training were to be shifted from provincial administration to the national Minister of Higher Education and Training. The merger of the 152 smaller technical colleges into 50 mega TVET colleges in 2002, along with the demand to increase student numbers and the additional requirement to implement new curricula has placed a huge strain on college management structures, often proving unequal to the task.

Current reality

Feedback received from a prior programme manager for NCV IT and current UMALUSI moderator for NCV IT highlighted a lack of top-down support from the DHET to support IT departments at colleges offering the NCV IT qualification:

“From 2007 – 2009 there were no curriculum advisors or circuit managers. Later curriculum advisors were appointed and reported directly to WCED. Currently the Western Cape [province] does not have a curriculum advisor for IT, the previous person vacated the post in 2014 as was never replaced.” (Manager1)

“Even with all these people in place they made no impact, because its not people who came in with fresh ideas. They were themselves educators that were promoted in those posts and they more overseers than innovators. They not going to speak to anything aggressively, they going to police what is already in place.” (HOD)

It was noted that programme managers and academic managers for ICT are often not driving partnerships with the ICT industry and introducing innovation into the NCV IT programme. Instead the delivery of the programme remains static with no improvement and real growth while the ICT industry continues to progress at a rapid rate.

“The so called leadership in these NCV IT programmes both at DHET and colleges, just do the same thing year in and year out, policing what is already in place rather than innovating and improving the programme.” (Manager1)

Design-Reality gap and implications

The post-merger lead to the creation of new management structures and the redeployment of staff within colleges to different management. This has not been matched with a systematic plan for developing the capacity of these managers to drive the college mandate in a strategic and effective manner. Furthermore it was noted that there is a lack of commitment from the DHET to support the programme in terms of its continuous development. This has left the programme on the back foot of industry demands for ICT skills supply. No further insight could be drawn from literature around the management of the

NCV IT programme leaving this dimension fairly undiscovered while potentially being a huge contributor to the programmes lack of success.

Gap = 8; core design expectations are partially met in reality.

5.7 Investment resource gaps

Even though financial investment is a challenge for developing countries, South Africa has prioritised spending on vocational education with its TVET sector supported from the country's national budget for education. Key concerns regarding financial investment into NCV IT are accountability, the appropriation of funds and the return on investment. Investment has been included in our evaluation as they are key drivers for enabling the programme, which equally has the potential to inhibit the programme's growth and development if funding is inadequate. This dimension discusses college-focused funding and student-focused funding.

Design expectations

A large-scale recapitalisation of TVET colleges was undertaken in 2007 with funds allocated to FET as an important impetus for the delivery of high quality programmes, a further R2.5 billion later committed in 2014. In addition to college and programme funding, government provided R9.3 billion to the National Student Financial Aid Scheme (NSFAS) in 2015. Of this amount, public higher education institutions were allocated R7.2 billion, while the remaining R2.1 billion was allocated to TVET colleges. Sources of TVET funding are largely from government, through direct transfers but partly from NSFAS support to students and revenue derived from course fees, donations and private sector support. Funding norms permit colleges to charge students an annual college fee of which public funding of programmes covers 80% of the full cost of the programme and tuition fees cover the remaining 20%. These investments are a direct result of funding required to overhaul the TVET sector coupled with students inability to pay tuition fees.

“Research has shown that one of the factors that contribute to low participation rate in FET college programmes is students' inability to pay college fees. In order to ensure that the student's inability to pay college fees does not constitute a barrier to learning opportunities in FET colleges, in 2006 Government announced an allocation of R600-m for bursaries over three years (2007-2009). The bursary scheme is administered by the National Student Financial Aid Scheme on behalf of the Department of Education.”
(National Policy for FET, 2008, p.8)

Current reality

Low throughput and certification rates are severely hampering the envisaged impact of TVET colleges. In 2013, for NC(V) level 2, only 33% of students who enrolled in all the required subjects to complete their current level were able to progress to the next year of study, while

a further 28% of eligible students did not write the exams at all, a throughput rate of under 24% was recorded. While accurate throughput rates tracking cohorts of students over the full three years of an NCV courses are not available, 2013 examinations data suggest that as few as 2% of all the students who start NCV courses at Level 2 complete the qualification up to Level 4.

A 2010 HSRC audit found that only 18 out of 50 colleges track the progress of students after they leave college. Poor certification rates, as low as 9.5% for the first cohort of National Certificate: Vocational (NCV) students in 2009, did not do much to help improve the perception of TVET college students nor did the lack of programme differentiation. The National Student Financial Aid Scheme (NSFAS) allocation has however ensured that students themselves could continue with free education, irrespective of the financial challenges faced by the institutions. There are obviously many challenges which directly affect learners in the administration of NSFAS mainly because of the colleges understanding and implementation the “Bursary rules and guidelines for the administration of NSFAS”. Further exacerbating the accountability of students to perform and repay grants is the recent recommendation by the Heher commission that all students at TVET colleges receive free education, while university students get government-backed loans that they would only need to start repaying at a specific income level.

Tuition fees per student for NCV IT students are funded on a two-to-one ratio, with a two thirds funded by government and a third due for payment by the student. The vast majority of students studying NCV IT secure bursaries from the government-funded NSFAS. These bursaries supplement the one third payment due by students that they do not have to repay upon graduation. The NCV IT programme is therefore a 100% funded program for most who register provided they are financially needy of it. Students therefore flock to the programme with little understanding of the course details and future prospects, but as a mechanism for funding their education ambitions. Many of these students realise the demanding and technical nature of the course too late and end up dropping out from the programme or pursuing the programme over an extended period of time. The consequence to this vicious has created learners that:

- leave mainstream school, perform poorly at colleges and either drop out along the way thereby failing to become productive citizens contributing to the economy, which ultimately affects unemployment negatively rather than positively as intended
- are enrolled for more than the budgeted 3 year subsidy period, which potentially increases the term of social expenditure for government. Few students entering TVET colleges qualify in the minimum period of three years. Instead of being solution to unemployment and economic woes it often drain government resources.
- graduate with low Grades and are unable to secure acceptance at higher education tertiary institutions for further study, again contrary to its intended objectives

These notions are suggestive of government getting a poor return on its investment, which continues to be disbursed regardless of the performance of colleges. TVET colleges receive

funding regardless of their pass rates or whether graduates get jobs. In addition, the rapid evolution of the ICT industry demands that practitioners and more so lecturers responsible for producing competent work force be appropriately skilled in the latest technologies.

Design-Reality gap and implications

Although there is huge financial investment being ploughed into programmes such as the NCV IT, little to no return on this investment is visible. It was further noted that there is a lack of accountability of both poor performing students that are not obliged to pay back bursaries, as well as poor performing colleges with low throughput rates still being funded.

Gap = 7; core design expectations are met in reality, but others are not.

5.8 Staffing and skills gaps

Considering the findings of the process dimension, the minimal throughput rates of NCV IT suggest substantial inefficiencies and poor quality of delivery in the programme. This dimension explores this notion further by reviewing required lecturer capacity, lecturer experience and the skills required to effectively execute the NCV IT programme.

Design expectations

The Development Bank of South Africa (DBSA, 2010) reported a significant loss in experienced human capital as a result of a shift in powers at government level after the introduction of the FET Act of 2006.

“The FET Colleges Act of 2006 shifted the powers of employment of educators to college councils. In this process, lecturers were given the option to remain within the college or be deployed to schools. It is understood that through this process colleges lost many lecturers with expertise (around 36% in one case). Lecturing staff opted for deployment to schools because they did not trust their new employer and did not want to put their government employment benefits at risk.” (DBSA, 2010)

A change in programme offerings as a result of the recapitalisation of the TVET sector and the vision to grow its student intake year on year prompted the need to employ suitably skilled staff to deliver the new TVET strategy.

Current reality

Considering the current reported shortage of skilled ICT professionals, colleges currently do not offer the competitive salary packages of its industry counterparts. As a result the makeup of NCV IT largely lack the required industry experience and knowledge of current ICT trends to drive the qualification forward.

“ICT professionals would rather work in industry where they can earn more. So we cannot recruit the required talent. Our colleges are full of foreign staff because our South African’s don’t want to earn that kind of money” (Manager2)

Provision of NCV IT teaching staff with an appropriate balance of technical training, pedagogical training qualifications and industry experience is perhaps the biggest problem facing the NCV IT programme in South Africa. The DBSA (2010) reports:

- 41% possess technical qualifications at NQF levels 6–8 but most of these do not have the necessary pedagogical qualifications;
- 26% of the respondents have technical qualifications at NQF levels 2–5 but most have no pedagogical qualifications;
- 33,5% have no technical qualifications but is the largest group of lecturers with pedagogical qualifications;

This is a problem that has been recognised within the sector and documented by UMALUSI, the quality assuring body for the NCV IT and other NCV programmes:

“It has been unofficially documented by Umalusi that kids are battling because colleges employing the wrong people. Its very difficult man, it comes down to rands and cents, you not going have an experienced developer [computer programmer] standing in front of a class of 16 year olds. Umalusi now insists they want a copy of the staff CV and credentials in the subject portfolio being moderated because they want to marry a subject to a persons qualifications.” (Manager1)

These shortcomings have also been identified by staff members who themselves recognise the shortcomings in their own education because they are being called upon to teach subjects where their own expertise is uncertain and tentative. Additionally, they find it challenging running practical lab based ICT sessions because they have limited experience.

“There are no guidelines for lecturer skills and qualifications requirements only suggestions. Therefore most of the IT lecturer learn on the job, They only have theoretical knowledge.” (Lecturer1)

“We have been stuck in the classroom too long, we need to get more involved in ICT conferences and interact with industry to keep up to date with what’s happening out there, and we don’t get any funding for training” (Lecturer4)

Design-Reality gap and implications

While the ICT sector in South Africa and globally has progressed NCV IT as a programme and its academics have stagnated as Colleges do not spend enough on staff development. College lecturers require a balance of technical and pedagogical qualifications, as well as industry experience. The data above suggests a concern on both the technical and pedagogical competence of the lecturers. Findings further highlight that lecturers' exposure to relevant industry-based work experience can be improved, and innovative ways of arranging such experience should be explored with industry leaders. Unless drastic progress is made future recruitment of competent ICT lecturers into the sector will be dampened.

Gap = 9; design expectations are not met in reality.

5.9 Milieu gaps

Political, Economic, Socio-cultural, Technological and Legal factors are some of the contextual factors that could shape the environment for organisational change (Heeks, 2011). We can argue that these have already been covered for NCV IT in previous dimensions. An additional contextual factor that has found to be significantly contributing to NCV IT is that of poor public perception.

Design expectations

A serious ramification of the stigma towards TVET is that many parents and guardians discourage and prevent their top performing children from pursuing TVET programmes due to its limited academic opportunities and lack of prestige that have characterized TVET over the years. With university education in South being out of reach for many, there exists a need to bring an alternative form of education to the population. For financially struggling parents it serves as a safety net providing an only alternative for pursuance of further studies. To change its poor public perception, FET colleges started offering what was marketed as "high quality" NCV programmes which were to gradually replace the old NATED report 191 (N) programmes (FET Plan, 2008).

Current reality

It was noted from feedback by graduates and industry representatives that an unfair trend of inappropriate categorization of NCV IT graduates by employers. Employers compare NCV IT graduate skills with that of university graduates but NCV generally only represents Grades 10, 11 and 12. This places NCV IT graduates in a disadvantaged position when applying for employment. The perception of the FET sector among employers have remained relatively unchanged and evident for their willingness to employ NCV IT graduates. Currently quite a lot of students with matriculation but with poor results enter colleges as a kind of second best to university. The sentiments of some industry representatives illustrated the negative stigma associated with TVET College graduates, with employers still opting to employ university graduates instead with the view that they are better equipped for the world of work. In other

cases employers were not aware of the NCV IT qualification at all and once again indicated the lack of industry linkages between industries and the TVET sector overall.

“This is my second job in the IT field, I have now realised that they [employers] don’t really take the NCV IT qualification serious because it doesn’t skill the people up enough” (Graduate1)

“When you go for an interview, they ask you what did you study and when you tell them they like don’t seem interested, we are being judged based on the poor NCV IT curriculum” (Graduate2)

“When you apply for a job people ask you what is NCV” (Graduate4)

“The NCV IT programme is pitched at NQF levels 2, 3 and 4 and that is why employers don’t take it serious. Maybe if the programme was pitched a bit higher, at level 5 for example then graduates will be able to transition into the world of work” (Lecturer2).

Many FET colleges lack public recognition and acceptance, in part because of similar problems of poor quality and inefficiency, but also because public attitudes and beliefs tend to favour ‘academic’ rather than ‘vocational’ education (White Paper IV, 1998):

“The other factor is that although the qualification was phased in as the N1-N3 Ministerially- approved programmes were phased out, these qualifications differed materially in terms of purpose, design and structure. The NC(V) therefore does not have a precedent qualification to which it may be benchmarked, and in the absence of such a benchmark has often been compared against NATED programmes, the national curriculum statements (NCS) of the National Senior Certificate (NSC) and Learnerships.” (Makole, 2010, p.2)

Design-Reality gap and implications

TVET colleges continue to suffer from an identity crisis and a negative stigma regardless of attempts to improve its public perception. NCV IT’s design was never meant to fit the social and student make up that we see in the programme today. The label attached to vocational education by industry is that of inferior qualification in relation to its university and vendor-based counterparts. Fair and appropriate marketing of programmes to avoid unrealistic learner expectations. The expectations of learners in the study were largely not met, and they conveyed their feelings of disappointment or had left the college because of this. Many referred to college promises that had not been kept. It was clear also from the school respondents in the study that the roles of vocational education, FET colleges and the new curricula are not fully understood.

Gap = 8; core design expectations are not met in reality.

5.10 Summary of research findings

The findings of the study presented above confirm initial assumptions of the researcher that gaps exist between the NCV IT programme's intended design and current reality at present. The findings are further indicative of progress in some areas of the NCV IT programme while the majority of areas continue to experience challenges which hinder its ability to deliver its ICT skills development mandate. A high-level summary of the results of the study are illustrated in Figure 5.6.

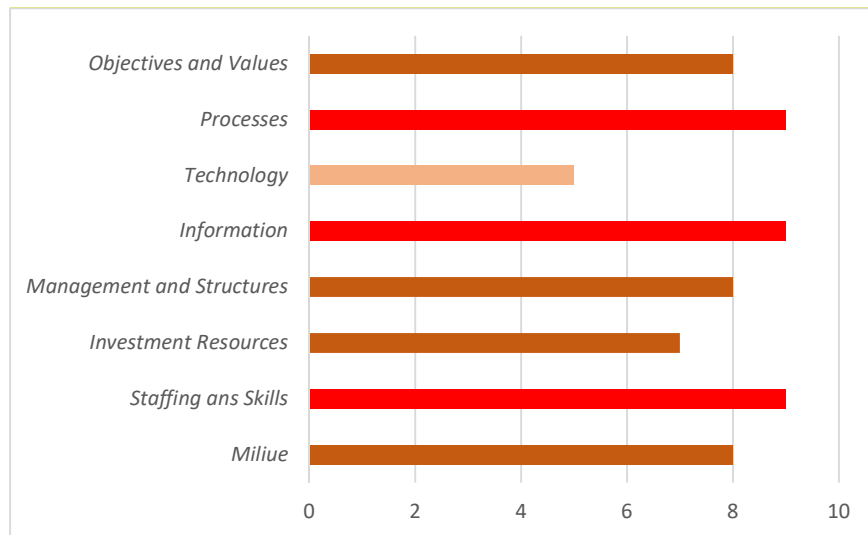


Figure 5.6: Size of gaps between NCV IT design and reality

Table 5.1: Likelihood of dimensions contributing to failure (Heeks, 2002)

Gap Score	Description
8.1 - 10	Very likely
6.1 – 8.0	Likely
4.1 – 6.0	Possible
2.1 – 4.0	Unlikely
0.0 – 2.0	Very unlikely

An analysis of the design-reality gaps indicated the overall NCV IT programme to have a final score of 63. The scoring of the project was calculated using the design-reality gap scores for each of the OPTIMISM dimensions. The overall gap score of 63 depicts the NCV IT initiative is and will remain close to a total failure without significant actions to close design-reality gaps.

Table 5.2: Interpretation of overall Design-Reality Gap score

Total Gap Score	Interpretation
0 - 14	The project has largely been successful, and is likely to continue to be so
15 - 28	The project is likely only a partial success and might continue to be so unless actions are taken to close remaining design-reality gaps
29 - 42	The project is likely a partial failure and will likely continue to be so unless gap-closure actions are taken
43 - 56	The project is a failure of some kind and this will continue unless gap-closure actions are taken
57 - 70	The project is and will remain close to a total failure without significant actions to close design-reality gaps

Our findings echo the sentiments in the literature which witnesses a strong support for TVET programme's by government hoping to bring about socio-economic development. The reality of these intentions however do not reflect the design objectives with unemployment and poverty remaining key concerns for the South African economy and graduates of the NCV IT programme remaining largely unemployed or employed outside of their field of expertise. The findings clearly position NCV IT as another government intervention aimed at socio-economic reform which enjoys only limited success as alluded to by Akoojee (2009). The NCV programme was largely developed to replace previously ineffective FET programmes which symbolised decades of disjointed education efforts. We observed the same mistakes being made in the development of the NCV IT with misalignment between the demand for appropriately skilled ICT workforce and its supply. The subsequent section discusses recommendations to reduce the design-reality gaps identified during the evaluation.

This chapter reviews the research questions, research objectives and the research model used. Finally, the conclusions drawn from the research are presented and areas for future research are proposed. Practical corrective actions are also suggested to reduce current design-reality gaps in the NCV IT programme, and improve the programmes likelihood of long term success.

6.1 A Review of the research model

The study has demonstrated the application of the Design-Reality Gap Model as an evaluative framework in VET programmes. Application of the Design-Reality Gap Model as the evaluative frame provided insight into a variety of dimensions which impact VET programmes. The model allowed the programme to be examined at a macro and micro level while considering both internal and external issues. One limitation of the model is that it's grouping scheme results in several factors being crammed into a single dimension (particularly into 'objectives and values' and 'information'). It was further noted that the model would not have worked particularly well if there were competing designs or competing ideas about what counts as 'reality'. The approach also takes no account of possible interaction between dimensions as a cause of failure which we have identified as a major contributing factor in our study.

6.2 Review of the research question and objectives

The study assumed there are gaps between the intended design of the NCV IT programme and its reality experienced at present. The objectives of the study were to:

1. To identify the NCV IT programmes intended design objectives and reality at present.
2. To analyse gaps between the programme's design and reality.
3. To determine the implications of these design-reality gaps.

The primary research question that the study intended to answer was **“What factors are hindering the NCV IT programme in achieving its ICT skills development mandate?”**. The overall gap score of 63 suggests that the programme can at present be categorised as a total failure without significant actions to close design-reality gaps. This notion is justified by the significant design-reality gaps identified across most dimensions. The top three contributing factors hindering the programme are:

- Process gaps
- Information gaps
- Staffing and skills gaps

These design-reality gaps are representative of barriers inhibiting the NCV IT programme's design objectives. Corrective action along particular dimensions are suggested to ensure the long term success of the NCV IT strategy and a more significant return on government's investment.

6.3 Recommendations to practice

Recommendations for the improvement of NCV IT, requires that the reality of the programme shifts closer to its initial design to ensure it meets its intended objectives.

6.3.1 Refining the curriculum

There exists a need to modernise the NCV IT curriculum and align it with advances in technology. Curriculum developers should engage with the ICT sector to assess the relevance and accuracy of the NCV IT curriculum at present thereby ensuring its fit-for-purpose. Industry engagement should focus on identifying and communicating the minimum requirements for graduates to address ICT skills required by industry. This requires colleges to work with curriculum experts who have an understanding of the subject matter and technical experts from within the industries concerned. TVET Colleges' should commit to adopt and teach new ICT technologies timeously. Collaboration with the ICT sector should be ongoing to review the NCV IT curriculum periodically where necessary, ensuring its continuous relevance continued buy-in by industry into the NCV IT programme. Vendor-based IT programmes could be incorporated into the curriculum to add credibility as the demands of the labour market change. College lecturers require greater and continuous exposure to the workplace to observe technological advances that can be applied in college curricula.

6.3.2 Improve access criteria

Entrance to the NCV IT programme should be defined based on cognitive ability required by the technical and demanding nature of its curriculum. In addition to academic entrance requirements, prospective students should undergo a ICT-specific assessment to confirm the capabilities of the candidate. Consideration should also be given to the broad category of students allowed entrance into the programme with specific reference to age and highest qualification at the time of registration. Although significant effort is being placed on access to NCV IT, greater consideration should be given to the quality of the programme which can also not exist in isolation to creating meaningful work opportunities for graduates.

6.3.3 Establish effective linkages with industry

It is common that many companies recruit graduates based on their idea of a "perfect candidate". Graduates of the programme require workplace experience, proven technical skills and a glowing academic report before they are considered for employment. However, the reality of employability is very different. Graduates from TVET institutions have no work-experience, no understanding of the mechanics of business and require development with

personal and interpersonal skills, let alone the technical expertise that they would ordinarily require to be productive at job commencement. There is a clear gap between NCV IT graduates ability to “hit the ground running” at the workplace. The imbalances between the graduates’ efforts at securing meaningful employment and business’s hesitancy to employ are evident. Greater collaboration efforts between TVET colleges and industry should be sought to improve employment opportunities. The lack of effective, intensive post-graduate training programme’s providing career focussed technical expertise, together with work-experience and personal/business development is in our view partly responsible for the failures to bridge the skills gap in South Africa. TVET institutions cannot be expected to produce “the perfect candidate”, rather it should produce appropriately skilled candidates but there should exist shared responsibility with employers to further develop graduates. Inclusion of actual workplace exposure in the theory-practice model during the course of the college training programme is suggested. Additionally there appears to be a lack of commitment from the DHET, IT Academic managers and IT programme managers to innovate and drive positive change to grow the programme from its current state.

6.3.4 Improve public perception

It is clear that having attended a TVET college is negatively associated with employment prospects. In addition to solving immediate operational challenges within the NCV IT programme, broader action needs to be taken to ensure TVET colleges are better recognised. If TVET colleges are indeed to become institutions of choice for large numbers of youth, providers of choice for employers, and credible feeder institutions into higher education, they have to become desirable and attractive places of employment for lecturers and managers. Key to success of the NCV IT qualification is to improve the overall identity of the NCV qualification as a whole. This requires the perceived value and usefulness and overall recognition of the qualification to be improved as well a notable increase in employment of NCV IT graduates by employers. An increased interest in employing NCV IT graduates will however require graduates to demonstrate a good grounding in current technologies, prompting reconsideration of the NCV IT curriculum. The focus of NCV in general should be equally on promoting quality education and the promotion of employment opportunities in contrast to improved access alone as these three elements cannot exist in isolation to each other.

6.3.5 Improve funding mechanisms

Current funding mechanisms for both TVET colleges and students are inappropriate and lacks accountability. Colleges continue to be funded irrespective of throughput levels and students continue to be funded up to one hundred percent of their tuition with no recourse to repay even after inferior academic performance. Rather than acting as an enabler, NSFAS funding attracts the wrong calibre of student to the NCV IT qualification. Students who do not have a keen interest in the subject matter nor the cognitive ability to deal with the programme are hopeful of receiving funding for studies after being turned down from other fields such as business, office administration or even other institutions.

The requirement of colleges to get “bums on seats” further exacerbates this problem, wherein lecturers are forced to source candidates to meet target totals to ensure job security, results in candidates who were clearly not fit for the course realising this later on and dropping out. An output based funding model for colleges is proposed and reform in the financial aid model to students focusing the cost per graduate, rather than on the more basic measure of cost per enrolment. It outlines the crucial role that certification rates play in determining the cost effectiveness of the sector, with low certification rates resulting in enormous costs per graduate. Even though targets in this sector are mostly focussed on enrolment numbers, if those enrolled do not graduate and become contributory elements of the economy, the sector provides no benefit to the country.

6.3.6 Enhance quality of teaching and learning

To address the design-reality gap associated with teaching and learning necessitates a systematic analysis of educator capacity and the continuous professional development of ICT lecturers. Greater investment in upskilling lecturers and improved infrastructure for delivery. Mechanisms for dealing with mixed classes and students with varying backgrounds are required. One of the greatest hindrance in in the NCV IT programme has been noted around the continuous professional development of staff. Colleges are reluctant to invest in the continuous upskilling of NCV IT staff to stay abreast with latest advances in technology, this largely attributed to budget constraints. Throughput rates for the NCV IT programme need to be bolstered to effectively meet the demand for skilled ICT workforce.

6.4 Further research

Continuous research is required to inform the NCV IT programme. This could possibly be executed by assigned academic staff directly involved in the execution of the NCV IT programme, the curriculum advisor or an appointed team of academics. The establishment of curriculum task teams consisting of academic lecturing staff should be assigned to promote the continuous progression of the curriculum. This research will evaluate industry needs and inform the NCV IT programme on a continuous basis to ensure the programme remains relevant and dynamic in its response to ICT skills needs. Often the outcome of VET evaluation studies, sit on shelves until they are outdated. Research conducted should filter back into the NCV system and serve as a driver for continuous improvement of the programme.

6.5 Conclusion

The very problems that the new TVET system and NCV qualifications were meant to address are being repeated in the new TVET system. Investment of large amounts of human capital in undertaking comprehensive evaluations will have no, or potentially negative rates of return if the results are not used to change the VET sector. The results of VET evaluations can be used to update policies and programmes through changes in legislation, regulations, administrative procedures, delivery, and evaluation mechanisms. To accomplish this, all major stakeholders must be appropriately involved in designing solutions. A return on the NCV IT investment can only be realised if there is a coherent plan of action which charts the

vision, mission, goals and strategies to guide and support TVET colleges in the execution of their mandate. Colleges, partly as a consequence of the deep systemic fault-lines identified in this study, partly through their own institutional weakness, and partly as a result of planning and implementation shortcomings by the education department became de-linked from the world of skills development. South Africa requires an effective ICT skills development strategy for the development of ICT skills. The result thereof will be the development of competent human resources that will generate sustainable economic growth, empower the poor, and extend the countries ICT service sectors.

Appendix A: Introductory letter to participants



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Department of Information Systems
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Tel: 650-2261
Fax No: (021) 650-2280

Introductory letter

My name is Yusuf Ryklief, a Master of Commerce (Information Systems) student at the University of Cape Town. A requirement for the Master of Commerce (Information Systems) degree at the University of Cape Town is the completion of a dissertation research project. My research endeavours involve the study of vocational IT education in South Africa's public TVET colleges and the challenges hindering the programme in effectively executing its ICT skills development mandate. The title of my study is:

Barriers and Enablers to Vocational IT education: Responding to South Africa's ICT skills crisis

I herewith enthusiastically invite you to participate in this study and contribute your experiences during your involvement in the programme. Please reply to this communicate at your earliest convenience indicating your willingness to participate in this study. Confidentiality and anonymity of the details and comments you provide in this study are guaranteed. All comments and details will be treated in strict confidence and will be used for the sole purpose of the aforementioned dissertation research project. Your participation in this study is voluntary. You may opt out of the study at any point in time without any consequences.

Kind Regards

Yusuf Ryklief
(Researcher)

A handwritten signature in black ink, appearing to read 'Y Ryklief', is written over a horizontal line.

Appendix B: Participant consent form



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Tel: +27 (0) 21 650 2261 Fax: +27 (0) 21650 2280
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Research Participant Consent Form

I, _____, herewith consent to participate in the
research entitled:

Barriers and Enablers to Vocational IT education: Responding to South Africa's ICT skills crisis

I am aware that participation is voluntary and that I may choose to withdraw from this
study at any time, should I choose to do so.

Name and Surname

Signature

Designation

Date

For any enquiries, please do not hesitate to contact:

Researcher:

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Facilitator's welcome, introduction and instructions to participants

Welcome and thank you for volunteering to take part in this focus group. You have been asked to participate as your point of view is important. I realize you are busy and I appreciate your time.

Introduction: This focus group discussion is designed to assess your current thoughts and feelings about the NCV IT programme. The focus group discussion will take no more than one hour. May I record the discussion to facilitate its recollection? (if yes, switch on the recorder)

Anonymity: Despite being recorded, I would like to assure you that the findings of the discussion will be reported on anonymously. The recordings will be kept safely in a locked facility until they are transcribed word for word, then they will be destroyed. The transcribed notes of the focus group will contain no information that would allow individual participants to be linked to specific statements. You should try to answer and comment as accurately and truthfully as possible. If there are any questions or discussions that you do not wish to answer or participate in, you do not have to do so; however please try to answer and be as involved as possible.

Consent: Could I ask that each participant complete the consent form and demographic details questionnaire, and return it to me before we proceed with the discussion.

Ground rules

- The most important rule is that only one person speaks at a time. There may be a temptation to jump in when someone is talking but please wait until they have finished.
- There are no right or wrong answers
- You do not have to speak in any particular order
- When you do have something to say, please do so. There are many of you in the group and it is important that I obtain the views of each of you
- You do not have to agree with the views of other people in the group
- Does anyone have any questions? (Answers).
- OK, let's begin

Appendix C: Focus group discussion questions - academic staff and management

Introductory question

Is anyone willing to share their views or experiences about the NCV IT programme as a ICT skills development strategy?

Guiding questions

1. Do you feel that the NCV IT programme has achieved its envisaged objectives and values?
2. Which processes are in place to aid in achieving the programmes objectives?
3. What technological infrastructure is in place to support the delivery of the programme objectives?
4. Describe the curriculum of the NCV IT programme?
5. What industry linkages are in place to support the delivery of the NCV IT mandate?
6. What are the management and programme structures like for the programme?
7. What investment resources are available to effectively support the mandate?
8. What are the staffing capacity, skills, experiences and qualifications of the NCV ICT lecturers like? And are they adequate?
9. What social, economic, political or technological factors impact of the delivery of the NCV IT mandate?

Concluding question

Are there any other thoughts that you feel are pertinent to this discussion that we may not have covered?

Conclusion

- Thank you for participating.
- Your opinions will be a valuable asset to the study.
- We hope you have found the discussion interesting.
- I would like to remind you that any comments featuring in this report will be anonymous.

Appendix D: Focus group discussion questions - students and graduates

Introductory question

Is anyone willing to share their experiences in NCV IT programme and how it has met or failed to meet your expectations?

Guiding questions

1. Do you feel that the NCV IT programme has helped you achieve your objectives?
2. What technological infrastructure is in place to support the delivery of the programme objectives?
3. Describe the curriculum of the NCV IT programme?
4. What industry linkages are in place to support the delivery of the NCV IT mandate?
5. What social, economic, political or technological factors impact on your learning in the NCV IT mandate?

Concluding question

- Are there any other thoughts that you feel are pertinent to this discussion that we may not have covered?

Conclusion

- Thank you for participating.
- Your opinions will be a valuable asset to the study.
- We hope you have found the discussion interesting.
- I would like to remind you that any comments featuring in this report will be anonymous.

Appendix E: Interview guide – ICT industry representatives

Guiding questions

1. Do you feel that the NCV IT programme has achieved its envisaged objectives and values?
2. Which processes are in place to aid in achieving the programme objectives?
3. What technological infrastructure is in place to support the delivery of the programme objectives?
4. Describe the curriculum of the NCV IT programme?
5. What industry linkages are in place to support the delivery of the NCV IT mandate?
6. What are the management and programme structures like in the programme?
7. What physical and financial resources are available to effectively support the mandate?
8. Are these resources appropriately allocated?
9. What staffing capacity, skills, experiences and qualifications are available to effectively deliver on the mandate? And are they adequate?
10. What social, economic, political or technological factors impact of the delivery of the NCV IT mandate?

Concluding question

- Are there any other thoughts that you feel are pertinent to this discussion that we may not have covered?

Conclusion

- Thank you for participating.
- Your opinions will be a valuable asset to the study.
- We hope you have found the discussion interesting.
- I would like to remind you that any comments featuring in this report will be anonymous.

Appendix F: Interview guide – NCV IT programme design representative

Guiding questions

11. Do you feel that the NCV IT programme has achieved its envisaged objectives and values?
12. Which processes are in place to aid in achieving the programme objectives?
13. What technological infrastructure is in place to support the delivery of the programme objectives?
14. Describe the curriculum of the NCV IT programme?
15. What industry linkages are in place to support the delivery of the NCV IT mandate?
16. What are the management and programme structures like in the programme?
17. What physical and financial resources are available to effectively support the mandate?
18. Are these resources appropriately allocated?
19. What staffing capacity, skills, experiences and qualifications are available to effectively deliver on the mandate? And are they adequate?
20. What social, economic, political or technological factors impact of the delivery of the NCV IT mandate?

Concluding question

- Are there any other thoughts that you feel are pertinent to this discussion that we may not have covered?

Conclusion

- Thank you for participating.
- Your opinions will be a valuable asset to the study.
- We hope you have found the discussion interesting.
- I would like to remind you that any comments featuring in this report will be anonymous.

Appendix G: Sample of coding process

Theme / Dimension	Design Aspect	Reality Aspect		
	Government	Students & Graduates	Management & Staff	ICT Industry Rep's
Objectives and Values	<i>"..aimed at learners in FET colleges. These learners leave the FET College either for higher education or for employment in the workplace...aims to equip learners adequately for entry into the world of work by providing them with practical skills related to a particular socioeconomic or vocational sector." ("Ministerial Task Team," 2012, p.5)</i>	<i>"Nowadays everthing is about IT. Every company needs to employ IT professionals so there is always work for people with IT skills" (Respondent13)</i>	<i>"NCV was government's way of getting rid of the old apartheid technical colleges, and they formed these mega colleges. NCV, if it worked it would solve their [governments] mass unemployment with the youth" (Respondent1)</i>	<i>None (Not applicable to industry representative's)</i>

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